21. European Stroke Conference
Lisbon, Portugal, May 22-25, 2012

Including
6th Stroke Meeting for Nurses, Physiotherapists, Speech and Occupational Therapists, Study/Research Assistant

Abstract E-book

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### Scientific Programme

#### Tuesday 22 May 2012 - Programme Overview

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- **15:00 - 15:30**: Coffee Break
- **18:00 - 19:30**: Opening Ceremony
6. Stroke Meeting for Nurses – Physiotherapists – Speech and Occupational Therapists Study/Research Assistant

**Chairs: V. Hömberg, Germany and S. Middleton, Australia**

**13.00-14.30**

**Plenary Session**

Fever, swallow, hyperglycaemia: implementing evidence in acute stroke care  
S. Middleton, Australia

Early care is relevant for good recovery and outcome  
H. Binder, Austria

Interplay between physicians, therapists and nurses in acute stroke  
Results of a preliminary analysis  
L. Saltuari, Italy

**14.30-15.00**

**Poster Session**

**15.00-17.00**

**Workshops A & B**

**WORKSHOP A** *(target audience: stroke nurses)*
Joint presentation by the stroke physician and stroke nurse

How to manage fever?  
L. Saltuari, Italy and C. Heinz, Austria

How to manage swallowing?  
H. Binder and TH. Zaussinger, Austria

How to manage hyperglycaemia?  
M.G. Hennerici and M.R. Hennerici, Germany

How to manage pain?  
D. Boering and C. Spahn, Germany

**WORKSHOP B** *(target audience: Physiotherapists, Speech and occupational therapists, psychologists)*
Evidence based vs individualised treatments

Introduction: Use and misuse of EBM in rehabilitation  
V. Hömberg, Germany

EBM concepts in motor rehabilitation  
G. Kwakkel, The Netherlands

EBM concepts in language rehabilitation  
F. Pulvermueller, UK

EBM concepts in cognitive rehabilitation  
C. Bindschaedler, Switzerland

EBM concepts in perceptual rehabilitation  
J. Zihl, Germany
Tuesday 22 May 2012

13:00 - 15:00 Auditorium V
1. Teaching Course Stroke algorithms, scales, and scores
   Chairs: H. Ay, USA and J. De Keyser, Belgium
   Ethiological subtyping tools – an update - H. Ay, USA
   Pitfalls with the NIH stroke scale - M.- L. Mono, Switzerland
   Measuring stroke outcome: when and how? - J. De Keyser, Belgium
   The ABCD2 score – what does it tell? - G. Tsivgoulis, Greece

13:00 - 15:00 Auditorium VI
2. Teaching Course Posterior circulation stroke syndromes
   Chairs: D. Kömpf, Germany and J.S. Kim, Korea
   Brain-stem stroke eponyms – an update - J.S. Kim, Korea
   Cerebellar stroke syndromes - T. Moulin, France
   Oculomotor presentations of brain-stem ischaemia - D. Kömpf, Germany
   Vertebral artery stenosis Clinical significance and management options - B. van der Worp, The Netherlands

13:00 - 15:00 Auditorium VII
3. Teaching Course Subarachnoid hemorrhage
   Chairs: G. Rinkel, The Netherlands and O. Nilsson, Sweden
   Diagnostic aspects of subarachnoid hemorrhage - M. Vergouwen, The Netherlands
   Less common variants of SAH: perimesencephalic and convexal bleeds - R. Geraldes, Portugal
   Update on SAH management and therapeutics - O. Nilsson, Sweden
   Long term prognostic aspects after SAH - G. Rinkel, The Netherlands

13:00 - 15:00 Auditorium VIII
4. Teaching Course Iatrogenic stroke
   Chairs: A. Tsiskaridze, Georgia and A. Lindgren, Sweden
   Perioperative stroke - A. Lindgren, Sweden
   Stroke related to cardiac procedures - C. Weimar, Germany
   Complications of thrombolytic therapy for ischemic stroke - N. Nighoghossian, France
   Intracranial bleeding complications of anticoagulant therapy - A. Tsiskaridze, Georgia

15:30 - 17:30 Auditorium V
6. Teaching Course Haemorrhagic stroke
   Chairs: C. Cordonnier, France and D. Werring, UK
   Is it a primary haemorrhage or secondary haemorrhagic transformation? - V. Caso, Italy
   Cerebral amyloid haemorrhage and intracerebral haemorrhage - C. Cordonnier, France
   Microbleeds – current concepts - D. Werring, UK
   Management of haemorrhagic stroke - T. Steiner, Germany

15:30 - 17:30 Auditorium VI
7. Teaching Course lacunar stroke and cerebral small vessel disease: from clinical presentation to treatment
   Chairs: R. van Oostenbrugge, The Netherlands and O. Benavente, Canada
   Lacunar stroke: clinical presentation and evidence for different subtypes - R. van Oostenbrugge, The Netherlands
   Small vessels elsewhere – what can they tell us about subtypes of cerebral small vessel disease? The retina and beyond - C. Chen, Singapore
   Imaging of lacunar stroke and related small vessel disease phenotypes.
   Relationship to background risk factors and future disease risk - F. Doubal, UK
   Treatment and secondary prevention of lacunar ischaemic stroke - O. Benavente, Canada

15:30 - 17:30 Auditorium VII
8. Teaching Course Advances in dissections
   Chairs: M. Arnold, Switzerland and E. B. Ringelstein, Germany
   The mystery of cervical artery dissections - M.-G. Bousser, France
   Advances in pathophysiology of dissections - S. Debette, France
   Advances in diagnosis of dissections - E. B. Ringelstein, Germany
   Management of dissections - M. Arnold, Switzerland

15:30 - 17:30 Auditorium VIII
9. Teaching Course Stroke prevention
   Chairs: H. Christensen, Denmark and G. Ford, UK
   What is an optimal blood pressure control? - S. Laurent, France
   Lipids and stroke. Statins for all? - H. Christensen, Denmark
   Modification of life style risk factors: which methods are most effective? - P. Wester, Sweden
   Prevention of stroke in the very elderly: should we be more cautious? - G. Ford, UK

15:30 - 17:30 Auditorium II
10. Teaching Course Scientific publishing in the stroke field
   Chairs: S. Davis, Australia and A. Alexandrov, USA
   How to write a good manuscript - A. Alexandrov, USA
   How to handle a rejection - N. Venkatasubramanian, Singapore
   How to write a congress abstract - A. Alexandrov, USA
   How to review - S. Davis, Australia
### Wednesday 23 May 2012 - Programme Overview

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**Note:** The programming and session details are subject to change. Please refer to the official conference schedule for the most up-to-date information.
3 Intracerebral/subarachnoid haemorrhage and venous diseases A
8:50 - 9:00
The incidence of cerebral venous thrombosis among adults: a cross-sectional hospital based study
J.M. Costiño1, S.M. Zuberbier1, M. Aarnikko1, J. Staun2
Academic Medical Centre, Amsterdam, THE NETHERLANDS1, Medical Centre Alkmaar, Alkmaar, THE NETHERLANDS2
Background: The incidence of cerebral venous thrombosis (CVT) among adults is estimated at 2 – 5 per million per year, but no population based data with adequate case ascertainment are available. Methods: We performed a cross-sectional study among all 19 hospitals in two Dutch provinces with a total population of 3.1 million. CVT cases diagnosed between January 1st 2008 and December 31st 2010 were identified using the Dutch financial coding system for hospital care (DBC) and the International Classification of Diseases system, 9th edition. All medical records of potential patients were hand searched to identify CVT cases. Eligibility criteria were: CVT diagnosed by magnetic resonance imaging with venography, computed tomographic venography, conventional angiography or autopsy; Age 38 years or older; resident of North-Holland or Flevoland; no other diagnosis at follow-up. Care was taken to avoid duplicate counts. Information on baseline condition, risk factors, treatment and outcome was recorded on a case report form. The Dutch national bureau for Statistics provided population figures of the 2 provinces during 2008 – 2010, which were used as denominator.
Results: Among 9270 potential cases, we identified 147 patients diagnosed with CVT. We excluded 53 patients for the following reasons: wrong diagnosis (9), duplicate count (13), age < 18 (17), and living outside of caption area (14). Therefore, 94 patients were included in the analysis. The overall incidence was 1.32 per million patient-years (95% CI 1.16 – 1.61). Median age was 41 and 72% were women. Women aged 31 – 50 had the highest incidence (27.8, 95% CI 19.8 – 38.2). Baseline clinical findings and risk factor profiles were similar as in previous studies of CVT. 96% of patients were treated with anticoagulation and mortality was 1% at discharge and 3% at 3-year follow-up.
Conclusion: The incidence of CVT among adults is much higher than previously believed.
Small juxtacortical hemorrhages specific for cerebral venous thrombosis

Academic Medical Centre, Amsterdam, THE NETHERLANDS

Background: Intracranial hemorrhages (ICH), including hemorrhagic infarcts, occur in 40% of patients with cerebral venous thrombosis (CVT). The morphology varies, ranging from local subarachnoidal hemorrhage and small subcortical hemorrhages to large subcortical hemorrhages. We examined whether small juxtacortical hemorrhages (JCH) are associated with a distinctive clinical profile and whether these hemorrhages are specific for CVT.

Methods: We retrospectively identified all CVT cases treated in our hospital between 2000 and 2010. Children younger than 12 were excluded. Data on clinical manifestations and outcome were extracted from hospital records. We scored cerebral imaging results and assessed location of the thrombus and the presence and type of parenchymal lesions. Small hemorrhages (<25 mm in diameter) located in the white matter just below the cortex were scored as JCH (figure). To determine the specificity of JCH for CVT, we assessed as controls all non-traumatic, non-CVT hemorrhages in patients younger than 60 treated during the same period in our hospital.

Results: 94 CVT patients were identified. 52 had an ICH, of whom 19 fulfilled the criteria for JCH. Twelve patients had multiple JCHs. In total, we identified 75 JCHs with a median diameter of 9 mm (IQR 7-13). When compared with the 33 patients with other types of ICH caused by CVT, patients with a JCH more often had focal neurological deficits (79 vs. 47%, p=0.005) and thrombosis of the superior sagittal sinus (100 vs. 36%, p=0.001). Mortality at follow-up was similar in both groups (26 vs. 21%, p=0.67). Among the 322 controls (non-traumatic ICHs, not caused by CVT) we identified 3 patients with a JCH. Thus, the specificity and positive predictive value of JCH for CVT were 99% (95% CI 97-100%) and 86% (95% CI 64-96%) respectively.

Conclusions: The presence of small juxtacortical hemorrhages is highly specific for cerebral venous thrombosis, and is associated with thrombosis of the superior sagittal sinus.
3:30 - 4:30
Oral Session, Experimental studies A

Chairs: P. Lindberg, Finland and D. Vivien, France

1 Experimental studies A

3:30 - 4:40

Anatomical images in normal and injured brain allow evaluation of tissue loss and possibly also of brain functional recovery. However, evaluation of brain gliosis remains difficult, as immunohistochemical techniques are not suitable to analyze the whole brain of living animals. Therefore, we compared the diffusion of magnetic nanoparticles (MNPs) with different magnetic properties into the brain of living rats, as a measure of brain permeability. Experimental studies

Methods: A total of 48 Wistar rats (200-220g) were divided into 3 groups: control (saline, n=16), Mn@Fe2O3 (100µg saline, n=16), and Mn@Fe3O4 (100µg saline, n=16). The MNPs were made by a novel synthesis method (gas-phase combustion). Three-dimensional diffusion of MNPs was visualized in vivo by T2-weighted magnetic resonance imaging (MRI). The volume of T2 hyperintense MNPs was calculated using a 3D cluster analysis.

Results: MNPs with T2 hyperintensity were observed in the control group with similar morphology as hemosiderin deposits. Mn@Fe2O3 MNPs showed a slower and more localized diffusion, whereas Mn@Fe3O4 MNPs diffused further with a similar pattern in both hemispheres.

Conclusion: The novel synthesis method and the MRI analysis demonstrate the potential of MNPs as an imaging tool to assess brain permeability in the living brain.

2 Experimental studies A

3:40 - 4:50

Antisaccade with the direct through hindlimb inhibitory dan gabitanin does not increase hemorrhagic complications after thrombosis in murine ischemic stroke


Department of Neurology, University Heidelberg, Heidelberg, GERMANY

Background and purpose: Oral anticoagulation (OAC) with dabigatranetexilate (DE) is an effective stroke prevention in patients with atrial fibrillation (Connolly, NEJM 2009). However, the management of ischemic stroke in patients on DE is challenging as thrombolysis is contraindicated because of a presumed increased risk of hemorrhagic complications. We examined in murine models of ischemia/reperfusion whether thrombolysis increases hemorrhagic transformation after thrombosis.

Methods: C57Bl/6 mice were pre-treated with previously established protocol (Zhou, Stroke 2011) of high-dose DE (4.5 mg/kg iv or 9 mg/kg ip.), warfarin (target INR 2-3.5), or no anticoagulant (nOAC). Mice underwent element MCAO for 2h. Thrombolysis with rt-PA (9 mg/kg) was started 90 min after ischemia-onset. After 24 h, animals underwent behavioral testing before being sacrificed. Infarct size, hematoma score, and hematoma photometry were measured.

Results: Infarct size did not differ among groups (nOAC:55±4.4, DE:53±3.1, nOAC:61±12, DE:warfarin:60±17; n=12/group) but the neurological score was significantly worse in the warfarin group. Both histological and hematoxylin score (nOAC:1.7±0.9, DE:4.51±1.7, nOAC:1.6±0.9, DE:2.6±0.7) and hematoma photometry showed significantly stronger hemorrhage in the warfarin group whereas DE and nOAC groups did not differ. Findings were reproduced in 180 min ischemia, and in experiments with repeated administration of DE. Comparable results for DE vs. nOAC were obtained in a rat model of thromboembolic focal ischemia.

Conclusions: In well established rodent models hemorrhagic complications after thrombolysis, DE in contrast to warfarin does not increase secondary hemorrhage. The mechanisms of this discrepancy between different classes of OAC despite effective systemic anticoagulation remain to be shown.

3 Experimental studies A

4:00 - 5:00

Thrombolysis with rt-PA under dabigatranetexilate in experimental stroke

B. Pfeilschifter, J. Pfeilschifter, F. Bohmann, J. Fleischhacker, E. Lindhoff-Last

Department of Neurology, Goethe University Hospital Frankfurt, Frankfurt am Main, GERMANY, Depart. of General Pharmacology and Toxicology, Goethe University Hospital Frankfurt, Frankfurt am Main, GERMANY

Background: The use of thrombolytics in patients on oral anticoagulation is controversial and currently not recommended. The aim of this study was to analyze the effects of rt-PA treatment in a rat model of ischemic stroke in the presence of dabigatranetexilate (DE).

Methods: 39 C57BL/6 mice were pre-treated orally with 75mg/kg DE, 112.5mg/kg DE, 2mg/kg warfarin, or saline. We performed right middle cerebral artery occlusion (MCAO) for 3h, administered rt-PA directly before reperfusion and assessed neurological deficit and HT blood volume after 24h.

Results: The incidence of hemorrhagic complications after thrombolysis (HT) was significantly higher in the DE group compared to the warfarin group (p=0.016). The risk of thrombolysis-associated HT may not be increased under DE pre-treatment up to plasma levels of 400 ng/ml, a concentration that was not exceeded in the majority of DE-treated patients. Higher plasma levels of DE were associated with a higher frequency of HT, whereas DE did not differ from nOAC in any parameter.

Conclusions: Dabigatranetexilate should not be withdrawn from patients prior to thrombolytic treatment as a precautionary measure to prevent HT.

4 Experimental studies A

9:00 - 10:00

Growth factors mediate reduction of infarct volume and functional recovery in cerebral ischemia through the increase of circulating mesenchymal stem cells


Clinical Neurosciences Research Laboratory, Department of Neurology, Hospital Clínico Universitario, University of Santiago de Compostela, Santiago de Compostela, SPAIN

Background: Growth factors such as VEGF and GM-CSF play an important role in neurorepair processes. Therefore, our aim was to study the effect of VEGF and GM-CSF treatments on the infarct volume, mobilization of mesenchymal stem cells (MSCs) and sensorial-motor deficits in rats subjected to ischemia by occlusion of the middle cerebral artery (MCAO).

Methods: Sprague-Dawley rats (250-275 g) were submitted to ischemia by intraluminal transient (90 min) MCAO. After ischemia, rats were randomized into 4 groups (n=12/group) treated with: 1) control group (saline); 2) VEGF (50 µg/kg i.c.v.); 3) GM-CSF (20 µg/kg i.c.v.); and 4) combined treatment (VEGF 50 µg/kg i.c.v. + GM-CSF 20 µg/kg i.c.v.). All treatments were intravenously (i.v.) administered at 24, 48 and 72 hours after MCAO. Infarct volume was measured by MRI at 24 and 72 hours after MCAO. In addition, functional recovery was assessed using the cylinder test, and circulating MSCs were measured by flow cytometry and characterized as CD90+ and CD45-.

Results: We observed that infarct volume was significantly reduced at 14 days after MCAO in VEGF (p=0.001), GM-CSF (p=0.041), and VEGF+GM-CSF treated rats (p=0.004) treated rats. VEGF and VEGF+GM-CSF (both p<0.0001) showed a significant effect on the mobilization of MSC at 7 days after MCAO. A significant functional improvement was observed in rats treated with VEGF (p=0.021) and VEGF+GM-CSF (p=0.026) at 14 days after MCAO, while no effect was observed for GM-CSF treatment. On the other hand, there was a negative correlation of the percentage of mobilized MSC with infarct volume at 14 days (r=-0.681, p=0.021) as well as functional recovery at the mentioned time (r=-0.780, p=0.005).

Conclusion: VEGF and VEGF+GM-CSF treated rats showed functional improvement and a decrease in infarct volume, which were associated with an increase of MSC mobilization.

5 Experimental studies A

9:10 - 10:00

SIRT1 IS INVOLVED IN NEUROPROTECTION AFTER EXPERIMENTAL STROKE IN MICE


Clinical Neurosciences Research Unit, Complutense Medical School, Madrid, SPAIN

Background: Sirtuin 1 (SIRT1) is a member of the NAD-dependent sirtuin family of deacetylases that have a key role in the maintenance of neuronal homeostasis. Recent studies have suggested a neuroprotective role for SIRT1 after ischemic stroke.

Methods: Male Sprague-Dawley rats (n=8/group) were subjected to transient focal cerebral ischemia (90 minutes) induced by middle cerebral artery occlusion (MCAO). In a subgroup of rats, SIRT1 expression was silenced by intracerebroventricular injection of adeno-associated virus (AAV) containing a short hairpin RNA (shRNA) targeting SIRT1. Open-field activity, body weight, and behavioral assessments were performed before and at 7 days after MCAO.

Results: SIRT1 silencing significantly reduced open-field activity and body weight gain in rats subjected to MCAO. In addition, SIRT1 silencing was associated with a decrease in motor performance on the rotarod test and a decrease in the number of crossings in the open-field test. These findings suggest that SIRT1 is involved in neuroprotection after experimental stroke in mice.
Interleukin-10: a key modulator of post-stroke neuroinflammation in experimental brain ischemia

University Hospital Heidelberg, Department of Neurology, Heidelberg, GERMANY1, German Cancer Research Center, Division of Functional Genome Analysis, Heidelberg, GERMANY1

Background. Neuroinflammatory cascades contribute substantially to permanent focal ischemia after brain injury. IL-10 is a key anti-inflammatory cytokine in neuroinflammation. We aimed to increase cerebral IL-10 concentration after stroke and then studied downstream pathways to better understand the underlying mechanisms of its neuroprotective effect.

Methods. Experimental brain ischemia was induced in C57Bl/6 mice by transcranial electrocoagulation of the middle cerebral artery. IL-10 was injected intracerebroventricularly (i.c.v.) or endogenously. IL-10 expression was increased by i.p. histone deacetylase inhibitors (HDACi).

The cellular source of IL-10 was analyzed immunohistochemically. Intracerebral downstream pathways were analyzed by western blot and RT-PCR. Whole genome microarray was performed by illumina mouse bead chips for naïve mice, IL-10 treated animals and controls at 24h and 3d after stroke.

Results. The i.c.v. injection of recombinant IL-10 significantly reduced stroke volume at 7d. HDACi increased endogenous IL-10 production in T cells, suppressed cerebral pro-inflammatory cytokine production (IFN-gamma, TNF-alpha, IL-17) and improved stroke outcome. Enhanced IL-10 expression resulted in increased phosphorylation of its main downstream mediator STAT3 in HIATD treated animals compared to controls.

Most of the genes significantly regulated by IL-10 (p<0.001) in the microarray analysis were detected already at 24h after ischemia (n=348), while at 3d only few genes were additionally regulated. Most of the IL-10 regulated target genes were involved in various inflammatory pathways, indicating a specific modulation of neuroinflammation by IL-10. Many of these genes are known neurotrophic mediators in brain ischemia.

Conclusion. Besides the injection of IL-10, its endogenous production can be boosted by HIATD. This is the first study using whole genome analysis detecting IL-10 target genes, thereby revealing the role of IL-10 in diverse inflammatory pathways.

7 Experimental studies A

Cytokine gene variants are associated with stroke in patients with essential hypertension

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Institute of Biochemistry and Genetics Ufa Science Centre RAS, Ufa, RUSSIAN FEDERATION

Objective. There is growing evidence that alteration in the pro- and anti-inflammatory cytokine production balance may contribute to the pathogenesis of cardiovascular disease. However, the exact mechanism of this contribution is still to be elucidated. The study objective was to test the hypothesis whether genetic polymorphisms of known pro- and anti-inflammatory cytokines are associated with cardiovascular complications in patients with essential hypertension (EH). Cytokines with potential pro-inflammatory activity (interleukin-1 beta, interleukin-6, tumor necrosis factor alpha, interleukin-12) and anti-inflammatory cytokines (interleukin-10 and interleukin-1 receptor antagonist) were chosen for current study. Methods. 355 patients with EH and 343 unrelated healthy age-matched individuals without family history of cardiovascular disease were included in the study. Both patients and control subjects originated from Tatar ethnic group from Bashkortostan, Russia. DNA was isolated from peripheral venous blood. Genotyping was performed using polymerase chain reaction (PCR) and restriction fragment length polymorphism analysis (PCR-RFLP).

Statistical analysis was performed using SPSS Statistics 17.0. P-value of <0.05 was considered statistically significant. Results. IL1B -511C*G type was more frequent in patients with stroke than in those with non-complicated EH (37.3% vs 57.52%, P=0.03). TNFA 308G*T was found to be protective against stroke in hypertensive patients (OR=0.40, CI 0.24-0.97). IL-6 -174G>C gene polymorphism frequency was increased in EH patients with stroke (82.5% vs 65.82%, P=0.03, OR=2.46, CI 1.37-2.52). In the same group, 1559P/A IL28B genotype frequency was associated with lower stroke risk (OR: 0.43, CI 0.21-0.89).

Conclusions. We demonstrated that common genetic variants of IL1B, IL1B, TNFA, IL6 and IL12B genes are significantly associated with the risk of stroke in patients with EH.

8 Experimental studies A

Tissue factor and P-selectin expression on platelet-derived microparticles in patients with cardiac and non-cardiac ischemic acute stroke or transient ischemic attack. E. Routo1, F. Motawa2, P. Sobczak-Dolina1, A. Janczak1, V. Frykman1, M. van Arbtil2, M. Rosynska1, N.H. Wallén1
1. Dept. of Clinical Sciences, Karolinska Institutet, Danderyd Hospital, Stockholm, SWEDEN, 2. Dept. of Molecular Medicine and Surgery/Couagulation Research, Karolinska Institutet, Stockholm, SWEDEN. 3. Dept. of Clinical science and Education, Karolinska Institutet, Stockholm, SWEDEN.

Background: Platelet derived microparticles (PMPs) are increased during platelet activation. PMPs have been reported to be increased in acute ischemic stroke and transient ischemic attack (TIA) and they may present a procoagulant surface.

In the present study we investigated PMPs in cardiac and non-cardiac ischemic acute stroke/TIA by investigating exposure of phosphatidylserine, P-selectin and tissue factor on PMPs by flow cytometric assay. Materials and Methods: PMPs were measured in plasma from 209 patients with acute ischemic stroke/TIA and in 65 ago-and sex-matched healthy controls. PMPs were defined by light-scattering characteristics and expression of GPIb/IX (CD42b). PMPs expressing phosphatidylserine (lactadherin), P-selectin (CD62P) and tissue factor (TF; CD142) were determined in the acute phase (median 3 days) and one month later. In addition, the combined use of small ECG monitoring device and the TOAST classification patients could be divided into cardiac ischemic and non-cardiac ischemic stroke, and PMPs in these two stroke subtypes could be compared. Results: PMP numbers were significantly higher both in the acute and one month later as compared to controls (p<0.0001 respectively). Furthermore, PMPs expressing the activation markers P-selectin and TF were markedly increased in patients as compared to controls at both time points (p<0.0001 for all), although the PMP number of both PMP subpopulations had decreased significantly in the one month sample (p<0.0001). No significant differences were observed between the cardiac ischemic and non-cardiac ischemic groups with respect to any of the PMP subpopulations investigated.

Conclusion: Ischemic stroke and TIA patients have elevated levels of circulating PMPs reflecting ongoing platelet activation, which persists one month after the event despite ongoing antithrombotic treatment. The pronounced increase in PMPs exposing TF and P-selectin may enhance thrombin generation and further augment platelet activation. The PMP pattern does not differ in patients with cardiac and non-cardiac ischemic stroke.

9 Experimental studies A

EXPOSURE TO HYDROGEN SULPHIDE DIMINISHES INFARCT SIZE AND ENHANCES RECOVERY: EXPERIMENTAL DATA IN A MCA OCCLUSION MODEL IN RODENTS E. Rooth, E. Rooth1, F. Mobarrez1, P. Sobocinski-Doliwa1, J. Antovic2, V. Frykman1, M. von Arbin1, M. Rosenqvist3, N.H. Wallén1
1. Department of Clinical Sciences, Karolinska Institutet, Danderyd Hospital, Stockholm, SWEDEN, 2. Department of Molecular Medicine and Surgery/Couagulation Research, Karolinska Institutet, Stockholm, SWEDEN. 3. Departamento de Neurología, Hospital Universitario la Paz, IDIPAZ, MADRID, SPAIN. FACULTAD DE MEDICINA DE LA UNIVERSIDAD COMPANIA DE LISBOA, LISBOA, PORTUGAL. 4. Centro de Neurociencias y Cerebrovascular Research Lab, Neurology Department, Hospital Universitario la Paz, IDIPAZ, MADRID, SPAIN. 5. FACUL- TAD DE MEDICINA DE LA UNIVERSIDAD COMPANIA DE LISBOA, LISBOA, PORTUGAL.

Background: Hydrogen sulphide (H2S) can regulate oxygen consumption by competing with co2 in binding to cytochrome C oxidase. At micromolar concentrations H2S interferes with anticoagulant and antiprostaglandin mechanisms, including upregulation of procoagulant genes. We studied the effect of H2S exposure after acute ischemic stroke in a MCA occlusion model.

Methods: Young adult male and female Sprague–Dawley rats distributed into three groups: 1-Control: Surgery + permanent MCAO - 2-Treated: Surgery + permanent MCAO + inhalation of 40 ppm hydrogen sulphide 3-Sham. We analyzed functional outcome (Rogers modified scale, tap test or rotarod) and lesion volume by MRI at 24h and day 14, and by hematoxylin/eosin stain. Cell death was assessed by TUNEL at day 14. Rats were sacrifi- ced at day 14.

Results: Treated animals showed a beneficial functional outcome both at 24h (P = 0.004445) and day 14 (P = 0.009942). We observed a decrease in infarct size in day 14 in MRI (p = 0.0383) and in hematoxylin/eosin infarct areas (p = 0.026672). At 24h there was no statistical difference in MRI infarct size (p= 0.38044). TUNEL analysis showed a decrease in the expression of marked cells in the perinfarct zone of treated animals (p= 0.048877).

Conclusion: Exposure to hydrogen sulphide was associated with an improvement in functional recovery both at 24h and 140 day after acute MCA occlusion. These data correlated with reduced lesion volume at sacrifice day, both in MRI and histology, with less expression of cell death at the peri infarct zone.
Assessing the variability of CTP post processing techniques to define the acute infarct core and penumbra

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University of Melbourne, Newcastle, AUSTRALIA

Aims: In order to fully validate CTP in the selection of acute stroke patients for treatment, characterisation of various deconvolution techniques that detect infarct core and penumbra is required. Methods: A cohort of 34 patients that presented within <6 hour hemispheric ischemia between 2004 and 2011 were studied retrospectively. Patients were imaged with multimodal CT at baseline and MRI at 24 hours. Perfusion CT maps were generated using the Maximum slope (Peeters) model, Partial Deconvolution (PD), Single Value Deconvolution (SVD), Single Value Deconvolution with Delay Correction (cSVD) and a Block Circulant Deconvolution (BCD). Pixel-based analysis of coregistered CTP and DWI was then used to define the optimum CTP perfusion thresholds for critically hypoperfused at-risk tissue and infarct core. Results: Using the Maximum slope model, a relative CBF <45% (of normal) was the best single threshold (AUC 0.88) to describe the acute infarct core. An MTT >15% of normal (AUC 0.71) was demonstrated the best threshold to define the acute penumbra. Using the partial deconvolution approach CBF >20% of normal (AUC 0.71) and an absolute CBF of 10 mL/100mg/min were the best descriptors of the acute infarct core. The acute penumbra was most accurately described as by an MTT >155% of normal (AUC 0.73) to TTP >4 seconds (AUC 0.74). The threshold to describe the acute infarct core with SVD was a CBF > 20 mL/100g/min (AUC 0.8). The penumbra was defined by a TTP >96 seconds (AUC 0.77). Using SVD with delay correction a CBF <45% of normal (AUC 0.77) accurately defined the acute infarct core. A relative delay time (DT) >2 seconds +normal (AUC 0.81) accurately defined the acute penumbra. Using a block circulant method the infarct core was best defined by a CBF <15 mL/100g/min (AUC 0.69) and a DT > 4 seconds (+baseline) is the most accurate when defining the acute penumbra (AUC 0.72). Discussion: cSVD was the most accurate method of defining both the acute infarct core and penumbra in this study. Of note is that a CBF was always the best method to define the acute infarct core, regardless of the method. However the threshold to define the acute infarct core did vary.

EPIFFET Investigators
Royal Melbourne Hospital, University of Melbourne, Melbourne, AUSTRALIA

Background: Collateral blood flow and perfusion-diffusion mismatch are often perceived as different, perhaps complementary, approaches to identifying patients with potential to benefit from reperefusion. We used a novel approach to grade leptomeningeal collaterals using perfusion MRI. Baseline mismatch and collateral grade were tested as predictors of mismatch salvage (adjusted for reperfusion) using data from the EPIFFET study. Methods: Acute perfusion raw data were averaged across 3 consecutive slices to increase leptomeningeal collateral vessel continuity after subtraction of baseline signal to mimic DSA (Figure). Collateral quality was independently assessed (ASITN/SSIR Grade 0-4) by two raters who reached consensus. The perfusion/Tmax>6sec mismatch diffusion mismatch volume and proportion (mismatch%) was calculated at baseline and 3-5days. Reperfusion was defined as f-1-subacute/baseLINE Tmax>6sec lesion volume. Mismatch good function was defined as baseline mismatch volume -absolute infarct growth. Results: Acute perfusion and diffusion MRI was analyzed for 85 patients 3-6h after stroke onset. Collateral grade was more strongly correlated with mismatch%/Spearmans’s Rho 0.51, p<0.001 than mismatch volume (Rho 0.23, p=0.03) and was inversely correlated with baseline DWI volume (r=0.70, p<0.001). Higher qualities collaterals (p<0.02) and increased mismatch%/p<0.001 predicted greater mismatch Salvage after adjustment for reperfusion (p<0.001). Combining the three parameters, baseline mismatch%/independently predicted mismatch salvage (p<0.001) but collateral grade did not improve the model (p=0.76). Conclusions: Simultaneously assessed mismatch% and collateral quality are correlated and both predict mismatch salvage when reperfusion is considered. However, collateral grade did not add to the predictive power of baseline mismatch, perhaps due to the greater spatial and temporal precision of volumetric mismatch.
Background: Magnetic resonance imaging (MRI) up to field strengths of 3 Tesla (T) has emerged as the most favorable imaging modality for the diagnosis of stroke. Ultra-high-field MRI at 7 T has recently shown encouraging results for non-stroke pathologies. This potential diagnostic improvement has not yet been applied to stroke imaging. We present the first evaluation of a stroke imaging protocol at 7 T in comparison to 3 T MRI.

Methods:
As part of an ongoing prospective observational imaging study, subacute and chronic stroke patients were imaged. 3 T imaging (Magnetom 3 T, Siemens Healthcare, Germany) immediately followed 7 T imaging (Magnetom Verio, Siemens Healthcare, Germany). Both protocols included T1-weighted 3D-MPRAGE, 2D T2-weighted FLAIR, T2-weighted 2D-TSE, 2D-FLASH (HemosFLASH) and 3D-TOF-angiography. NIHSS was assessed before MR scanning.

Results:
8 patients were imaged (3 females; 2 subacute [13 and 14 after start of stroke]; 6 chronic [median years after stroke 1.6; interquartile range 1.3-5.2]; median age 47 years [38-59]; median NIHSS at admission 2.5 [2.5 - 4.3]; median NIHSS at imaging 0 [0 – 1]. In FLAIR-imaging, all lesions were readily visible at both field strengths. In all other sequences a clearer spatial resolution with more anatomical details were seen at 7 T e.g. with respect to vessel structure, periventricular lesions and microinfarcts. Longer acquisition times and/or higher power deposition resulting in a decreased brain coverage were present in some sequences at 7 T. Conclusion: In our sample of stroke patients, 7 T MRI yielded a much richer diagnostic information currently acquired at 3 T MRI. Additionally, 7 T MRI provided a higher spatial resolution and a relevant improvement with respect to the visualization of infarct related alterations in stroke. In benefit in terms of clinical stroke imaging has to be evaluated in the future

6 Brain imaging A
9:20 - 9:30

MR perfusion imaging during thrombolysis in acute stroke patients. First results.
R. Kern 1, M. Griebe 1, K. Szabo 1, C. Sick1, J. Gregori 2, J. Sauter-Servaes 1, M. Wolf 1, P. Eisele1, M.G. Hennerici 1, M. Günther 2

Introduction: The ongoing single-centre “MR perfusion imaging during thrombolysis” study, funded by the Federal Ministry of Education and Research, Germany, aims at assessment, characterization, and monitoring of cerebrovascular perfusion deficits in acute stroke patients treated with intravenous recombinant tissue plasminogen activator (rtPA). The study protocol includes perfusion-weighted imaging (PWI) at baseline and after 15, 45, and 90 min of rtPA treatment. In addition, a control group will be imaged in the large MDC’s Stroke Research Center Berlin (CSB) to assess the performance of PWI-derived maps in head-to-head comparison with state-of-the-art CTP from other institutions. In particular, the aim of this study is to address the question, whether PWI derived maps are superior to CTP derived maps and how results from both modalities can be translated into clinical practice.

Methods: PWI is performed on a 3 Tesla (T) Siemens Verio scanner. Noncontrast CTP is performed on a 64-row CT scanner (Philips). Maps of relative cerebral blood flow (rCBF), volume (rCBV), mean-transit-time (rMTT) and time-to-peak (rTTP) were calculated. CTP was performed on an ECAT EXACT HR scanner (Siemens/CTI). In a region of interest based approach, the performance of PWI derived perfusion maps was assessed using quantitative CBF-PET maps with respect to penumbral flow. The best PWI threshold to detect penumbral flow was calculated for each imaging modality.

Results: Among the 16 eligible patients, 10 were treated with rtPA and remained in the MR scanner during the 60 minutes of treatment. Among the 10 patients treated with rtPA, 9 had evidence of acute cerebral ischemia on DWI. On visual inspection, a good qualitative congruence was found for pCT derived maps. In a pooled analysis of 5 acute stroke patients (median time MRI to PET: 58 minutes; patients imaged within 6 hours after stroke), penumbral perfusion was assessed using quantitative PWI maps with respect to penumbral flow (rCBF <20 ml/100g/min).

Conclusions: While PWI offers certain features over CTP (e.g., shorter imaging time), quantification of perfusion with PWI is challenging. The PWI image post-processing and quantification algorithms used in this study failed to detect penumbral flow. In future studies, a comparison of PWI and CTP should be performed with a dedicated PWI protocol at 7 T, which is currently under development.

8 Brain imaging A
9:40 - 9:50

MR perfusion imaging during thrombolysis in acute stroke patients. First results.

Introduction: This ongoing single-centre “MR perfusion imaging during thrombolysis” study, funded by the Federal Ministry of Education and Research, Germany, aims at assessment, characterization, and monitoring of cerebrovascular perfusion deficits in acute stroke patients treated with intravenous recombinant tissue plasminogen activator (rtPA). The study protocol includes perfusion-weighted imaging (PWI) at baseline and after 15, 45, and 90 min of rtPA treatment. In addition, a control group will be imaged in the large MDC’s Stroke Research Center Berlin (CSB) to assess the performance of PWI-derived maps in head-to-head comparison with state-of-the-art CTP from other institutions. In particular, the aim of this study is to address the question, whether PWI derived maps are superior to CTP derived maps and how results from both modalities can be translated into clinical practice.

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Conclusions: While PWI offers certain features over CTP (e.g., shorter imaging time), quantification of perfusion with PWI is challenging. The PWI image post-processing and quantification algorithms used in this study failed to detect penumbral flow. In future studies, a comparison of PWI and CTP should be performed with a dedicated PWI protocol at 7 T, which is currently under development.
Predictors of intracranial haemorrhage after intravenous rPA: a systematic review and meta-analysis of 52 studies

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Background
We aimed to systematically review the associations between baseline variables with symptomatic intracranial haemorrhage (ICH) after intravenous rPA for the treatment of acute stroke.

Methods
We searched Medline and EMBASE from 1966 to October 2011, reference lists and personal files for studies measuring an association between an admission clinical or imaging variable with symptomatic ICH after treatment of acute stroke patient with rPA. 3 authors extracted data, resolving differences by discussion. We used random-effect meta-analysis and meta-regression commands in Stata 11.

Results
We identified 52 relevant studies of 32 baseline clinical variables giving 245 estimates of the association of baseline variables and subsequent ICH. 7 studies were linked to randomised controlled trials. There were 5 definitions of symptomatic ICH. There were no consistent differences in the strength of the association of baseline variables with symptomatic ICH by study design or definition of haemorrhage. 79247 (32%) associations were adjusted for the potentially confounding effects of both age and stroke severity. An increased risk of ICH was consistent across studies (I2 < 20%) when a patient had: atrial fibrillation (OR 1.88, 95%CI 1.51-2.34, 10 studies), diabetes (OR 1.56, 95% CI 1.22-2.80, 11 studies), prior hypertension (OR 1.56, 95%CI 1.18-1.99, 9 studies), a point higher NIHSS (OR 1.07, 95% CI 1.07-1.99, 12 studies) and the presence of leuococytosis on baseline CT (OR 2.84, 95% CI 1.89-4.29, 21 studies). Though summary estimates showed an increased risk of ICH with following variables, there was substantial heterogeneity between the study estimates: age, systolic blood pressure, serum glucose, antipatepitel use and low density on CT brain scan.

Conclusions
There were moderate, consistent associations between some baseline variables and an increased risk of symptomatic ICH after rPA treatment. However, these variables may not predict the risk of overall harm from rPA treatment.

Endovascular treatment versus endarterectomy for carotid artery stenosis: results from the updated systematic Cochrane review
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BACKGROUND: Endovascular treatment (EVT) may be a useful alternative to carotid endarterectomy (CEA) for the treatment of atherosclerotic carotid stenosis.

METHODS: We selected all randomised trials comparing EVT (balloon angioplasty or stenting) with CEA. Analysis was by intention-to-treat with Peto fixed-effect models and, in case of significant heterogeneity, also with Mantel-Haenszel (MH) random-effects models.

RESULTS: In trials including 7752 patients undergoing 7758 procedures were selected. In symptomatic stenosis, the risk of death or any stroke between randomisation and 30 days after treatment (primary safety outcome) was higher in EVT than CEA (FE OR 1.70 [95% CI 1.38, 2.10], p<0.00001; MH OR 1.72 [2.6, 235], p=0.0006). The OR for this outcome was 1.16 [0.80, 1.67] in patients <70 years old, and 2.17 [1.58, 2.98] in patients >70 years old (p=0.014). There was no significant interaction with sex. EVT was associated with lower risks of myocardial infarction (OR 0.46 [0.24, 0.86], p=0.01), cranial nerve palsy (OR 0.16 [0.12, 0.21], p<0.00001) and access site haematoma (OR 0.34 [0.22, 0.54], p<0.00001). Intraprocedural stroke after the peri-procedural period did not differ between treatments (OR 0.93 [0.60, 1.45]), but severe re-stenosis was more common after EVT (OR 2.12 [1.55, 2.89], p<0.00001; MH OR 2.06 [1.41, 2.33], p<0.05). In asymptomatic stenosis, the difference in the primary safety outcome was not statistically significant (OR 1.69 [0.80, 3.39]).

CONCLUSIONS: EVT is associated with an increased risk of peri-procedural stroke or death compared with CEA, but the excess risk is limited to older patients. EVT has lower risks of myocardial infarction, cranial nerve palsy, and access site haematoma. Both treatments appear to be equally effective at preventing stroke after the peri-procedural period, but more data are needed to assess the longer-term efficacy of EVT, and to determine the optimal treatment for asymptomatic stenosis.

Frequency and natural history of post-stroke fatigue: a systematic review of longitudinal studies
T. Duncan, O.C. Mood, S. Wu
University of Edinburgh, Edinburgh, UNITED KINGDOM

Background: Fatigue is a common and distressing symptom after stroke. Stroke survivors and health professionals need to know a) whether fatigue is likely to improve, or get worse over time; and b) whether there is a temporal association with depression or anxiety.

Method: We systematically searched Medline, EMBASE, CINAHL and PsycInfo using the keywords “fatigue” and “stroke” and their associated terms or synonyms on 7th April 2011. Data were extracted regarding time points after stroke where fatigue was assessed, frequency of fatigue at each time point and any reported associations with anxiety and/or depression.

Results: 101 full texts were retrieved after scrutinising the titles and abstracts of 7046 citations. Nine (n=95) fulfilled our inclusion criteria. Fatigue was assessed at a variety of time points after stroke (from admission to 36 months). The frequency of fatigue ranged from 35%-92% at the first time point. Frequency of fatigue declined across time points in seven of the studies (n = 764) and increased in two studies (n = 195). Three papers found significant associations between fatigue and mood at the single time point. The single study investigating temporal associations between fatigue and mood disorders reported that depression predicted subsequent fatigue. Conclusions: Fatigue is present soon after stroke onset and remains common in the longer term. There is little evidence regarding the temporal relationship between fatigue and mood: this is an area where further research is needed.

Stroke patients as a proportion of patients with suspected stroke: a systematic review and meta-analysis
L. Gibson, W.N. Whiteley
University of Edinburgh, Edinburgh, UNITED KINGDOM

Background: We aimed to determine the proportion of stroke patients in consecutive series of patients with suspected stroke. We systematically reviewed the published medical literature.

Method: We searched Ovid Medline from 1948 to 28th October 2010 for prospective studies of suspected stroke patients with an electronic search strategy. In addition, we searched our files for further studies. We translated studies published in European languages other than English. As we had limited resources, we did not routinely contact study authors, search the ‘grey’ literature, or include studies in non-European languages. We meta-analysed proportions as the back transforms of the weighted mean of the transformed proportions in StatsDirect.

Results: We identified 20 studies including 7221 patients. Based on the referral population, 9 studies were from emergency departments, 4 from primary care, 3 from an ambulance service and 4 were unspecified. Overall, about two thirds (64.8%) of patients had a diagnosis of stroke, though there was significant heterogeneity in this estimate. This estimate did not vary significantly by referral source, imaging used, or study size. The ten most frequent non-stroke diagnoses in order of frequency were: seizure, syncope, epispis, functional disorders, migraine, brain tumours, metabolic complications, radiocapathies or neuropathies, vertigo and complication of dementia.

Conclusions: Patients with stroke – who usually have other neurological disease – account for a significant proportion of patients assessed by stroke services. Stroke services need to have the expertise to manage them at the point of referral.
Cerebral microbleeds and the risk of intracerebral haemorrhage after thrombolysis for acute ischaemic stroke: systematic review and meta-analysis
A. Chardigny1, P. Kakar1, Z. Fox2, D.J. Werring1
UCL Institute of Neurology and The National Hospital for Neurology and Neurosurgery, Queen Square, London, UNITED KINGDOM, Department of Stroke Medicine, Imperial College, London, UNITED KINGDOM; Bio medical Research Centre, UCL and Education Unit, UCL Institute of Neurology, Queen Square, London, UNITED KINGDOM

Background: Thrombolysis is the main treatment for acute stroke. Intracerebral haemorrhage (ICH) remains a devastating yet unpredictable complication. Cerebral microbleeds (CMBs), a new MRI marker of haemorrhage-prone microangiopathies, might help to identify a subpopulation of patients at high risk. We performed a systematic review and meta-analysis, to assess whether the presence of CMBs on pre-thrombolysis MRI scans is associated with an increased risk of ICH.

Methods: We searched PubMed and Embase for studies assessing ICH risk in patients with acute ischaemic stroke treated with thrombolysis, in relation to the presence of CMBs on pre-treatment MRI scans. Two authors criti cally appraised studies and extracted data independently. We calculated the pooled prevalence of CMBs, and the relative risk (RR) of ICH in patients with vs. without CMBs, using the Mantel–Haenszel fixed-effect method. We used I-squared and q-squared statistics to assess heterogeneity.

Results: We identified six studies including 890 patients (156 with CMBs). The CMB (+) vs. CMB (-) groups were not significantly different in age, gender or stroke severity in any of the studies. The pooled prevalence of CMBs was 18% (95% CI: 14.5%–21.5%). Amongst patients with CMBs, 19/136 (14.1%) patients experienced an ICH after thrombolysis, compared to 51/734 (6.9%) patients without CMBs; the pooled RR of ICH was 1.37 [95% CI: 0.86–2.18; p=0.190; I-squared= 0%; p=0.790].

Conclusion: These data suggest that the risk of ICH-related mortality is higher when patients in CMBs, although this was not statistically significant. Additional studies are needed to evaluate whether this risk outweighs the benefit of thrombolysis in a subpopulation of patients with CMBs. (e.g. those with multiple lobar CMBs indicating cerebral amyloid angiopathy). Larger multicentre studies using standardised CMB detection and rating methods are needed to quantify any potential increased risk of ICH associated with CMBs.

Meta-analysis and reviews
9:40 - 9:50
10:00 - 10:10 Coffee Break
10:10 - 11:30 Opening/Johann Jacob Wepfer Award
11:30 - 12:30 Oral Session.Large Clinical Trials A
Chairs: J.P. Mohr, USA and D. Toni, Italy
1 Large clinical trials (RCTs) A
1:30 - 11:40
Primary analysis of the International Carotid Stenting Study: A randomised comparison of the effectiveness of carotid stenting and endarterectomy in preventing long-term stroke in patients with symptomatic carotid stenosis
M.M. Brown1, J. Dobbs1, D. Doig1, R.L. Featherston2, E. Turner2
ICSS Collaboration
UCL Institute of Neurology, London, UNITED KINGDOM, London School of Hygiene and Tropical Medicine, London, UNITED KINGDOM

BACKGROUND The aim of treatment of carotid stenosis is to prevent stroke. Meta-analysis of the randomised trials has shown that the early risks of stroke and death after carotid stenting (CAS) are higher than after carotid endarterectomy (CEA) in older patients, but are similar in younger patients. However, the effectiveness of CAS compared with CEA in the long-term prevention of stroke has not been established. We therefore report the primary analysis of the International Carotid Stenting Constellation Study (ICSS) which randomised patients with symptomatic carotid stenosis (>50%) to either CAS or CEA. This trial was stopped after 1387 patients were enrolled due to unanticipated delays in patient recruitment.

Methods: We performed a network meta-analysis comparing the baseline characteristics were well balanced between groups. The duration of follow-up was a median of 4.1 years (maximum 10.0 years in the CAS group and 4.0 maximum 9.4 years) in the CEA group with a total follow up of 9930 patient-years. The results of the primary analysis will be presented. Secondary analyses will include rates of ipsilateral stroke after treatment assessed per protocol and subgroups analysis, including comparison of age (<70 and
Scientific Programme

2 Large clinical trials (RCTs) A
11:40 - 11:50
Results of DEFUSE 2: penumbra-based patient selection for acute endovascular stroke therapy
M.G. Lamberg, M. Mlynash, S. Hamilton, G.W. Albers, on behalf of the DEFUSE 2 investigators
Stanford University, Palo Alto, USA

Aims: To determine if the clinical and radiological response to endovascular reperfusion differs depending on baseline MRI characteristics.

Methods: Patients with an NIHSS>5 who were scheduled to undergo acute endovascular therapy were enrolled in this multi-center prospective cohort study if a baseline MRI could be obtained. Follow-up MRIs were obtained within 12 hours after endovascular therapy and at day 5. We hypothesized that the benefit from reperfusion would be greater in patients with a Target Mismatch (TMM) than in patients without. TMM criteria were predefined as: a ratio between PWI/TMax<6s and DWI lesion volume >1.8, DWI >70mL, and PWI/TMax<10s/>100mL. Favorable clinical response was predefined as a >8 point improvement on the NIHSS or an NIHSS of 0-1 at 50 days.

Results: 110 of 138 patients who signed informed consent underwent endovascular therapy. Early reperfusion was achieved in 46 of 79 (59%) patients with TMM and in 15 of 26 (57%) patients without TMM. Reperfusion was associated with a higher percentage of favorable clinical response in TMM patients (70% with reperfusion vs 33% without; p=0.001) but not in patients without TMM (42% favorable clinical response with reperfusion vs 78% without; p=0.2). The odds ratio for clinical favorable response associated with reperfusion was higher in TMM patients (3.0; 95% CI 1.9-3.3) than in those without TMM (0.2; 95% CI 0.03-4.5; p=0.002 for difference between odds ratios). Early reperfusion was also associated with infarct growth attenuation in TMM patients (median growth 12% with reperfusion vs 412% without reperfusion; p=0.002) but not in patients without TMM (relative median growth 10% in reperfusers vs. 11% in non-reperfusers; p=0.7).

Conclusion: Endovascular reperfusion is associated with improved clinical and radiological outcomes in TMM patients but not in patients without TMM. These findings support the use of PWI/DWI as a tool to select patients for endovascular therapy.

3 Final Results of the International Citicoline Trial on acUte Stroke (ICTUS Study) A
for the ICTUS Trial Investigators, Hospital Germans Trias i Pujol, Badalona, SPAIN1, Hospital de la Vall d’Hebron, Barcelona, SPAIN1, Centro Hospitalario Universitario. Santiago de Compostela, SPAIN1, Universitat Politecnica de Catalunya, Barcelona, SPAIN1, Hospital La Paz, Madrid, SPAIN1, Hospital Santa Maria, Lisboa, PORTUGAL2. Clínica Universitaria de Navarra, Pamplona, SPAIN2, Grupo Ferrer S.A., Barcelona, SPAIN3

Background: Citicoline has shown some evidence of efficacy in an individual patient data metaanalysis based on four clinical trials. The purpose of the ICTUS study was to confirm prior global results.

Methods & Patients: ICTUS was a multicenter, randomized, double-blind, placebo-controlled trial following a sequential design to test efficacy or futility with an upper limit of 3350 patients to maintain the 80% statistical power for a treatment effect of 1.26 (common odds ratio). The Study Population were male or female patients older than 18 years, with focal symptoms referable to MCA territory, baseline NIHSS score >8, neuroimaging compatible with the diagnosis of acute ischaemic stroke. Patients had no pre-stroke disability and were able to be treated within 24 hours from onset. Patients were randomized to receive either citicoline or placebo at a dose of 1000 mg/12 hours for 6 weeks.

Primary endpoint consisted in a combination of three measures of success evaluated at 12 weeks: absence of neurological deficit (NIHSS 0-1), disability (modified Rankin score, mRS 0-1), and dependency on daily living activities (Barthel Index, 95-100), averaged using the Global Test on the basis of intention-to-treat analysis. Results of the single scales at week 12 and shift analysis of Rankin scale were secondary endpoints. Adverse events, symptomatic hemorrhagic transformation in patients treated with rTPA (ECASS criteria), neurological deterioration and mortality were the main safety variables.

Results: After the third interim analysis with 2087 patients, a statistical stopping boundary was crossed. In accordance with the protocol, the enrolment was halted at October 28, 2011 and all the enrolled patients completed the study. The study finished with 2229 patients and the TSC was kept blind to the stopping reason until databases were closed. Primary and secondary efficacy and safety results will be presented (EndusCT 2005-048282-35; Clini-Trail.gov NC1070311890).

4 Large clinical trials (RCTs) A
12:00 - 12:15
The third international stroke trial (IST-3) main results part I: Primary and secondary outcomes among 3035 patients randomised
J.M. Wardlaw1, R. Lindsley1, M.S. Dennis1, G. Cohm1
IST-3 Collaborative Group
University of Edinburgh, Edinburgh, UNITED KINGDOM1, University of Sydney, Australia, AUSTRALIA1

Background: IST-3 seeks to improve the external validity and precision of the estimates of the overall treatment effects (efficacy and safety) of rtPA in acute ischaemic stroke, and to determine whether a wider range of patients might benefit.

Design: International, multi-centre, prospective, randomised, open, blinded endpoint (PROBE) trial of intravenous rPA, 0.9 mg/kg in acute ischaemic stroke. Patients had to be assessed and able to start treatment within 6 hours of developing symptoms and a brain imaging must have excluded intracranial haemorrhage and stroke mimics. Detailed protocol at www.ia3.com.

Results: 3035 patients were recruited, of whom 1617 (53%) were aged > 80 years. We will present analyses comparing the effect of r-PA with control on, a) events within 7 days: fatal & non-fatal symptomatic intracranial haemorrhage; fatal & non-fatal neurological deterioration, attributed to swelling of initial ischaemic stroke; fatal & non-fatal neurological deterioration not attributable to brain swelling or symptomatic intracranial haemorrhage; fatal & non-fatal recurrent ischaemic stroke; death from any cause within 7 days. b) the primary outcome (proportion of patients alive and independent at 6 months as assessed by the Oxford Handicap Scale (OHs) 0,1,2). c) adjusted for key covariates (secondary unadjusted and ordinal analyses and effect on favourable outcome (OHs 0,1) will also be presented), c) deaths from all causes within 6 months.

Conclusion: The data from the trial will: improve the external validity and precision of the estimates of the overall treatment effects (efficacy and safety) of IV rPA in acute isnchaemic stroke; provide new evidence on the balance of risk and benefit of intravenous rPA among types of patients who do not clearly meet the terms of the current EU approval; and, provide the first large-scale randomised evidence on effects in patients over 80, an age group which has largely been excluded from previous acute stroke trials.

5 Large clinical trials (RCTs) A
12:15 - 12:30
The third international stroke trial (IST-3) of thrombolyis Main results II: effects of IV thrombolyis. IST-3 in context of an updated meta-analysis of the randomised trials
J.M. Wardlaw1, P. Sanderson1, V. Murray1, E. Bengt1, G. del Zoppo1, R.L. Lindsley1, M.S. Dennis1, G. Cohm1, IST-3 Collaborative Group
University of Edinburgh, Edinburgh, UNITED KINGDOM1, Karolinska Institute, Stockholm, SWEDEN2, Dept Internal Medicine, Ullevaal Hospital, Oslo, NORWAY3, University of Washington Harbour View Medical Center, Seattle, USA4, University of Sydney, Sydney, Australia, AUSTRALIA1, University of Edinburgh, Edinburgh, UNITED KINGDOM1

Background: Results from new trials should be viewed in the context of an updated systematic review (Clarke JAMA 1998;280: 280). We aimed to add the main IST-3 results to the Cochrane Systematic Review to determine whether a wider range of patients might benefit.

Design: We updated the Cochrane systematic review (last update 2009) of all unconfounded randomised trials of IV r-PA vs control in patients with acute ischaemic stroke treated within 6 hours of stroke. In addition to adding IST-3 data to the meta-analysis, we searched electronic databases, the Cochrane Stroke Group Specialised Trials Register, meeting abstracts, relevant journals and the internet for any additional new trials. We extracted data on trial methods and all key outcome events, in key subgroups where available. We estimated the summary odds ratio and its 95% confidence interval (fixed effect meta-analysis) for the effects of IV rPA compared with control on early and late risks and benefits. Early (≤10 days) outcomes include: intracranial haemorrhage (fatal; symptomatic); massive intracranial swelling; deaths (total causes; non-haemorrhage-related). Late (>3 month) outcomes include: deaths (total causes); all causes; from 10days onwards; alive and independent (modified Rankin Scale (mRS)0-2.5); dead or dependent in activities of daily living (mRS 3-6). Sensitivity analyses include effects in patients randomised <3 and 3-6 hours, prior aspirin use (yes/no) functional outcome (mRS 2-6 v 3-6).

Results This analysis will include data from 12 trials of IV-PA with outcome data available for over 7000 patients.

Conclusion: The analysis will provide a comprehensive and up-to-date summary of the short- and longer-term effects of IV rPA within 6 hours on key safety and efficacy outcomes.
12:45 - 14:15 Lunch Satellite Symposium Boehringer Ingelheim

**Acute stroke management: Making every second count**
Chairs: J. M. Ferro, Portugal and D. Leys, France

- Optimising prehospital management of stroke
  M. Grond, Germany

- Improving onset-to-needle time: the PROFIL-AVC experience
  S. Timsit, France

- Extending the time window: a licence to take more time?
  K. Lees, UK

- IST-3: what are the implications for rtPA therapy?
  P. Sandercock, UK

Sponsored by Boehringer Ingelheim

12:45 - 14:15 Lunch Satellite Symposium Bayer

**From study to practice: changing the mindset on prevention of stroke in patients with AF**
Chairs: W. Hacke, Germany and J. Morais, Portugal

- Stroke prevention in AF – translating clinical evidence into real-world outcomes
  J. Camm, UK

- Latest insights from ROCKET AF
  G. Hankey, Australia

- Secondary stroke prevention with the newer agents: what is the evidence?
  W. Hacke, Germany

Sponsored by Bayer Pharma

14:45 - 14:15 E-Poster Session (p. 81)

**Red and Poster Session Red, Nurses and AHP’s Poster Session (p. 133)**

Chairs:
- E-Poster Session: L. Caplan, USA, M. Endres, Germany, J.M. Ferro, Portugal, V. Thijs, Belgium

14:30 - 16:30 Educational Symposium 1

**New Anticoagulants in Secondary Stroke Prevention in Patients with Atrial Fibrillation**
Chairs: H.C. Diener, Germany and G. Hankey, Australia

- Which of the new drugs is the best for secondary stroke prevention?
  G. Hankey, Australia

- Are there patients left to be treated by vitamin-K antagonists?
  P. Michel, Switzerland

- Current status of antiarrhythmic medication and interventional techniques
  P. Milliez, France

- Individualised treatment to optimize benefit and decrease risk
  H.C. Diener, Germany

14:30 - 16:30 Mini Symposium 2

**Intravenous thrombolysis for acute ischaemic stroke in 2012: where are we now and what’s on the horizon?**
Chairs: A. Czlonkowska, Poland and S. Rucci, Italy

- What do the IST3 results mean for the elderly patient with acute stroke?
  R. Lindley, Australia

- Which parameters predict who will have symptomatic intracranial bleeding or massive cerebral oedema?
  J. Wardlaw, UK

- What is the prognosis of mild and severe strokes?
  E. Berge, Norway

- How will stroke services across Europe need to change to increase equity of access to thrombolysis?
  D. Leys, France

- What’s on the horizon?
  P. Sandercock, UK
Plasma FVII-Activating Protease (FSAP) Antigen and Activity Levels are Increased in Ischemic Stroke

**Abstract:** Background: Chronic kidney disease (CKD) is associated with a higher incidence of first-time stroke, little is known about the link between CKD and vascular events after a recent ischemic stroke. Furthermore, while cardiac disease patients with CKD may obtain greater vascular risk reduction from add-on renin angiotensin system (RAS) modulation than without this risk, this issue has not been studied in stroke patients. We assessed CKD as a procoagulant among recent ischemic stroke patients, and evaluated whether add-on RAS therapy was associated with lower vascular risk in stroke patients with CKD. Methods: We analyzed the database of a multicenter trial involving 20,332 recent ischemic stroke patients randomized to receive telmisartan (80 mg daily) vs. placebo, and followed for 2.5 years. Subjects were divided into two groups based on presence of CKD. CKD was defined as estimated glomerular filtration rate (eGFR) < 60 mL/min. Cox proportional hazards models examined the relationship between presence of baseline CKD vs. occurrence of the primary outcome (stroke, myocardial infarction or vascular death and secondary outcome). Among CKD patients, the independent effect of telmisartan (vs. placebo) on the primary outcome was also evaluated. Results: Mean age was 66 ± 8.5 years, 6612 (35.5%) were women, and 3630 (19.5%) had CKD at baseline. In unadjusted analyses, patients with CKD were more likely to experience the primary outcome (HR 1.49, 95% CI: 1.36 – 1.63) and the secondary outcome (HR 1.29, 95% CI: 1.15 – 1.45). After adjusting for confounders, presence of CKD was still associated with the outcomes, but to a lesser extent: primary outcome (HR 1.27, 95% CI: 1.15 – 1.39) and secondary outcome (HR 1.13, 95% CI: 1.01 – 1.28). Telmisartan treatment among CKD patients was not associated with the primary outcome (HR 0.99, 95% CI: 0.85 – 1.16) or the secondary outcome (HR 1.08, 95% CI: 0.88 – 1.33) outcomes. Conclusions: Low eGFR is independently associated with a higher risk of recurrent vascular events after a recent ischemic stroke, but add-on telmisartan therapy does not seem to mitigate this risk.

**Keywords:** Chronic Kidney Disease, Stroke, Vascular Risk, Telmisartan.

**Acknowledgments:** Supported by the Swedish Research Council (projects 2012-5554 and 2016-04994), the Swedish Heart and Lung Foundation (20120414), the Swedish Research Council for Engineering Sciences (project 2016-06017), and the National Institutes of Health (R01HL141898).
Background: Type 2 diabetes mellitus is a major risk factor for vascular disease, including stroke. Moreover, several studies suggest that pre-cursor stages of diabetes, such as impaired fasting glucose and insulin resistance, already increase the risk of vascular complications. The aim of this study was to investigate if markers of insulin resistance were associated with risk of stroke in the general elderly population.

Methods: The study was conducted as part of the large population-based Rotterdam Study and included 5,234 participants who were aged 55 or older and stroke-free and diabetes-free at baseline (1990-1991). Follow-up for incident stroke was complete up to January 1, 2009. Fasting serum insulin levels and the homeostatic model assessment for insulin resistance (HOMA-IR) were used as markers for insulin resistance. Cox regression was used to determine associations between insulin resistance markers and the risk of stroke and its major subtypes, adjusted for age, sex, and a propensity score of potential confounders.

Results: During a median of 12.6 years of follow-up (median 8.6 years), 366 first ever strokes occurred of which 225 were cerebral infarctions, 42 were intracerebral hemorrhages and 99 were unspecified strokes. Fasting insulin levels were not associated with risk of any stroke or cerebral infarction or intracerebral hemorrhage. HOMA-IR, which almost perfectly correlated with fasting insulin levels, was also not associated with risk of stroke or stroke subtype.

Conclusion: In this population-based cohort study among nondiabetic elderly people we found no evidence for an association between markers of insulin resistance and risk of any stroke, cerebral infarction, or intracerebral hemorrhage.

6 Etiology of stroke and risk factors A
15:26 - 15:38

6.1 Contribution of insulin resistance to the cardiovascular risk in migraineurs: results from a case-control study
B. Onoishi, A. Casilina, D. Degan, A. Carolei, S. Sacco, Department of Neurology, University of L’Aquila, L’Aquila, ITALY

Background: Migraine and, especially migraine with aura (MA), is a risk factor for cardiovascular diseases (CVD). Many studies have proven an adverse cardiovascular risk profile in migraineurs with respect to non-migraineurs including high body mass index (BMI), insulin resistance (IR), even in the absence of diabetes mellitus, is an emerging risk factor for CVD. Data regarding the association between migraine and IR are conflicting and lack details referring to migraine type. We evaluated the possible association of migraine and its subtypes with IR. Methods: We included consecutive subjects with MA or migraine without aura (MO) referring to our Headache Center. Each patient was paired with a control selected among patients admitted to our hospital for traumatic injuries. Exclusion criteria were diabetes mellitus, BMI>35, history of overt CVD, and use of drugs interfering with glucose metabolism. IR was calculated by means of the Homeostatic Model Assessment (HOMA), using a blood sample obtained in the morning after overnight fasting. Data regarding anthropometric measures and comorbid risk factors were also collected. Comparisons were performed by Student’s t-test or Chi-square test. Power's test was used to assess correlations. Results: 85 migraineurs (82.4% women) and 50 controls (74.0% women) were included in the study. Mean age ±SD was similar in migraineurs (75.1±9.9 years) and in controls (76.3±12.8, p=0.55). Among migraineurs, 50 had MO and 35 MA. Higher BMI (23.9±4.0 vs 22.4±3.0, p=0.003) and glycemic values (87.8±9.8 vs 84.0±7.6 mg/dl, p=0.02) were found in migraineurs in respect to controls. Mean HOMA index values were similar in migraineurs and in controls (1.6±0.9 vs 1.5±0.8, p=0.47) and in subjects with MO vs MA (1.6±1.0 vs 1.7±0.8, p=0.88). In both migraineurs and non migraineurs there was an association between HOMA index values and BMI, more relevant in the former than in the latter group (r=0.362, p=0.001 vs d=0.031, p=0.034). Conclusions: Our data indicate that all subtypes of ischemic stroke as well as ACAS are strongly associated with IR and increased PI and PAI-1 levels. Specific patterns of dyslipidemia in ACAS and IST were observed.

7 Etiology of stroke and risk factors A
15:38 - 15:40

Risk factors for early versus late recurrent ischemic stroke after TIA versus stroke in the Oxford Vascular Study
O.C. Geraghty, N.L.M. Paul, Z. Mehta, P.M. Rothwell

INTRODUCTION: Risk of recurrent stroke after TIA or stroke is highest acutely and then declines but remains elevated for several years. Risk factors for recurrent events differ from those for incident events, but there may be differences in terms of the magnitude of risk and the timings of peaks in risk. The cumulative incidence of recurrence is 20% at 5 years. Prognostic scores may be required for patients with TIA versus stroke and for early versus late recurrence.

METHODS: All recurrent ischaemic strokes were identified in OXVASC TIA and stroke patients from 2002-09. Risk factors for early (>90 day) versus late recurrence (>90-day) and for recurrence after TIA versus stroke were explored. Results: Of 1,798 patients, 729 (41%) presented with TIA and 1,069 (59%) with stroke. 124 (6.8%) had early and 121 (6.7%) had late recurrent ischemic stroke. Symptomatic carotid stenosis predicted early but not late recurrence, whereas atrial fibrillation predicted late recurrence but not early. Increasing age, symptomatic carotid stenosis, atrial fibrillation and prior recurrent events were risk factors for recurrence after either TIA or stroke, but frailty (HR=2.18, 95%CI 1.33-3.50) was independently predictive only in the early recurrent stroke group. Conclusions: Our data indicate the lack of any association between migraine and its subtypes and IR.

8 Etiology of stroke and risk factors A
15:40 - 15:40

Risk factors for early versus late recurrent ischemic stroke after TIA versus stroke in the Oxford Vascular Study
O.C. Geraghty, N.L.M. Paul, Z. Mehta, P.M. Rothwell

Stroke Prevention Research Unit, Nuffield Department of Clinical Neurosciences, University of Oxford, Oxford, UNITED KINGDOM

INTRODUCTION: Risk of recurrent stroke after TIA or stroke is highest acutely and then declines but remains elevated for several years. Risk factors for recurrent events differ from those for incident events, but there may be differences in terms of the magnitude of risk and the timings of peaks in risk. The cumulative incidence of recurrence is 20% at 5 years. Prognostic scores may be required for patients with TIA versus stroke and for early versus late recurrence.

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9 Etiology of stroke and risk factors A
15:40 - 15:40

SMASH-EU: a proposal for etiologic classification of ICH
A. Mijajlovic 1, A. Jotic 2, N. Lalic 2, N. Covickovic-Sternic 1

1Department of Neurology, University of Belgrade, Belgrade, SERBIA 2Clinic for Endocrinology Clinical Center of Serbia and School of Medicine University of Belgrade, Belgrade, SERBIA

Background: There are several widely recognized etiologic classifications for ischemic stroke, but a practical one for intracerebral hemorrhage (ICH) is lacking. A solid clinical classification may improve patient care; help in identifying relevant etiologic factors, in planning secondary surgical and medical treatment measures, and in future research.

METHODS: We performed a retrospective chart review of all consecutive ICH patients treated at the Helsinki University Central Hospital, January 2005 to March 2010 (n=1,013). We classified the ICH as caused by structural lesions (5%), medication (4%), amyloid angiopathy (4%), hereditary disorders (3%), hypertension (H), or undetermined (U) etiologic factors. SMASH-U classification was supported by clinical and radiological features and 3-month mortality.

RESULTS: During 42,806 person-years of follow-up (median 8.6 years), 366 first ever strokes occurred of which 225 were cerebral infarctions, 42 were intracerebral hemorrhages and 99 were unspecified strokes. Fasting insulin levels were not associated with risk of any stroke or cerebral infarction or intracerebral hemorrhage. HOMA-IR, which almost perfectly correlated with fasting insulin levels, was also not associated with risk of stroke or stroke subtype.

Conclusion: In this population-based cohort study among nondiabetic elderly people we found no evidence for an association between markers of insulin resistance and risk of any stroke, cerebral infarction, or intracerebral hemorrhage.

The SMASH-EU etiologic classification of ICH proposed here was in strong agreement with a baseline 3-month mortality outcome in this cohort.
How much daily rehabilitation do acute stroke patients really receive?

The Royal College of Physicians, London, UNITED KINGDOM, St George’s Healthcare NHS Trust, London, UNITED KINGDOM; University of Manchester, Manchester, UNITED KINGDOM; Guy’s and St Thomas’ NHS Foundation Trust, London, UNITED KINGDOM

Background:
There is evidence of a relationship between intensity of therapy and patient outcome. NICE Quality Stroke Standard Statement 7 (2010) recommends that a minimum of 45 minutes of physiotherapy (PT), occupational therapy (OT) and speech and language therapy (SALT) is provided daily if the patient requires and can tolerate that amount.
The study aim was to assess the percentage of new stroke patients deemed appropriate by the therapy team for 45 minutes of therapy and the proportion of patients who received the recommended amount during the first 28 weekdays of their inpatient stay.

Methods:
Data from the National Sentinel Stroke Audit snapshot on the number of patients achieving the NICE standard were analysed for the first time. 11,353 patients admitted 1 April – 30 June 2010 in England, Wales and Northern Ireland were included. Full definitions were provided. The median number of days on which therapy was considered appropriate and the average daily amount received was analysed for patients with a relevant impairment at stroke.

Results:
Of patients with motor deficits, 26% (1838/7219) and 31% (2148/7017) were not considered appropriate on any day for PT and OT respectively. 50% of patients (2692/5371) with dysphasia/dysarthria were considered inappropriate for SALT.
The percentage of patients considered appropriate and who received 45 minutes of PT, OT and SALT were 32%, 31% and 18% respectively.

Conclusion:
A surprisingly small proportion of patients with impairments are deemed by therapists as appropriate for 45 minutes of each relevant therapy and a smaller proportion of these patients receive this. This is of particular concern in the context of decreasing length of stay on stroke units and suggests that the overall amount of therapy received by patients may be relatively low.
14:30 - 16:00 Oral Session. Vascular Biology

# Management and economics
15:20 - 15:40
Randomised comparative efficiency of telephone versus mail follow-up in the Australian Stroke Clinical Registry (AuSCR).
D.A. Caulfield1, N. Lamont2, J. Lunt3, C. Pincus4, C. Faux5, C. Levy2, G.A. Donnan2, C. Anderson1, Monash University, Clayton, AUSTRALIA1, Alfred Hospital, Prahran, AUSTRALIA2, The George Institute for Global Health, Sydney, AUSTRALIA3, National Stroke Foundation, Melbourne, AUSTRALIA4, St Vincent’s Hospital, Sydney, AUSTRALIA5, John Hunter Hospital, Newcastle, AUSTRALIA6, Florey Neuroscience Institutes, Parkville, AUSTRALIA7

Background and purpose: Clinical registries provide ‘real life’ data on process of care and outcome. Although recovery and adverse events are most informatively assessed after hospital discharge, uncertainty exists over the most efficient method of following up patients in large, prospective, stroke registries.

Methods: In the pilot phase of the national AuSCR conducted in 8 hospitals, registrants were randomly assigned to complete a health survey by mail or telephone interview at 3-6 months post-stroke. Non-respondents had up to 3 extra contact attempts with the final attempt using the alternate method. Detailed resource utilisation data was obtained (i.e. labour, supplies, postage, telephone call costs). Unit prices were taken from financial records. Ascertainment costs (0.2 weeks at £21.00 for telephone and £23.00 for mail) were included for each attempt within the randomized approach.

Results: A total of 191 strokes occurred in 153 patients with known prior AF. After stroke, the healthcare costs were £10,413 (S.D. 15,105) in the acute phase, with costs varying from £3,945 (S.D. 7,558) for non-disabling to £25,729 (S.D. 16,396) for disabling events. Annual post-acute healthcare costs were £5,370 (S.D. 7,516), a non-significant increase from those incurred during the year before the stroke (£2,566, S.D.5,856, P = 0.333). After stroke, 21 (13%) patients were newly admitted into long-term, nursing or residential care, resulting in mean annual costs of £6,880 (S.D. 15,600) averaged across all 153 patients. CONCLUSION: Stroke patients with prior AF incur high costs both in terms of acute healthcare and long-term nursing/residential care, which must be taken into account in estimating the cost-effectiveness of new treatments to prevent stroke in patients with AF.

# Management and economics
15:40 - 15:45
Population-based study of acute- and long-term care costs after stroke in patients with AF
G.S.C. Yin 1, R. Luengo-Fernandez 2, A.M. Gray 2, P.M. Rothwell 1

Population-based study of acute- and long-term care costs after stroke in patients with AF.

RESULTS: In total 372 patients with stroke (194), TIA (157) or amaurosis fugax (21) were referred for Doppler ultrasound examination. Doppler identified 12 patients with 50-70% stenosis and 20 patients with > 70% stenosis. Of these, 26 patients were further evaluated with acetazolamide-challenged HMPAO-SPECT.

CONCLUSION: Stroke patients with prior AF incur high costs both in terms of acute healthcare and long-term nursing/residential care, which must be taken into account in estimating the cost-effectiveness of new treatments to prevent stroke in patients with AF.

# Management and economics
15:45 - 15:50
Costs of secondary prevention of stroke by carotid endarterectomy
T.S. Olsen, M.P. Søndergaard, C. Haraldsen
Frederiksborg University Hospital, Frederiksborg, DENMARK

Background: We estimated the costs to the Danish National Health Service of preventing strokes due to carotid artery stenosis taking all cost elements into consideration i.e. identification of patients, Doppler examination and the operative procedure (carotid endarterectomy).

METHODS: Estimates are based on all incident and recurrent stroke (Oxford Vascular Study). We assessed the acute and long-term costs of stroke in AF patients. Healthcare costs one year before and 5 years after stroke were determined. Costs were assessed for the 3-month post-stroke (acute period), and annually thereafter (post-acute period). Annual post-acute costs were compared to annual baseline costs. Based on patients’ living arrangements, costs of institutionalisation after the event were included.

RESULTS: A total of 191 strokes occurred in 153 patients with known prior AF. After stroke, the healthcare costs were £10,413 (S.D. 15,105) in the acute phase, with costs varying from £3,945 (S.D. 7,558) for non-disabling to £25,729 (S.D. 16,396) for disabling events. Annual post-acute healthcare costs were £5,370 (S.D. 7,516), a non-significant increase from those incurred during the year before the stroke (£2,566, S.D.5,856, P = 0.333). After stroke, 21 (13%) patients were newly admitted into long-term, nursing or residential care, resulting in mean annual costs of £6,880 (S.D. 15,600) averaged across all 153 patients. CONCLUSION: Stroke patients with prior AF incur high costs both in terms of acute healthcare and long-term nursing/residential care, which must be taken into account in estimating the cost-effectiveness of new treatments to prevent stroke in patients with AF.

# Management and economics
15:50 - 16:00
A National Assessment of Factors Influencing Emergency Medical Services Times Among Acute Stroke patients
V. Judzos, S. Pavar, S.A. Chaudhry, G.J. Rodriguez, F.K. Sari, A.I. Quebede
Zeneq Qureshi Stroke Research Center, University of Minnesota, Minnesota, USA

Background: The time spent in Emergency Medical Services [EMS] assessment and transport is a critical determinant of time interval between symptom onset and treatment for acute stroke. We studied the determinants that influence EMS times which is a composite of response, assessment, and transport times for acute stroke patients.

Methods: The 2009 national Emergency Services Information System [NEMSIS] Registry dataset representing 24 states in US was used to identify the patients diagnosed by EMS personnel to be having stroke / cerebrovascular accident [CVA] on arrival at the scene of incident. Total EMS times defined as time interval between dispatch call and completion of transport to emergency department [importance of mino [confidence intervals] were calculated and compared in various patient strata defined by factors such as dispatch center identification of stroke / CVA, barriers (language and physical) at the scene, location and demographic factors.

RESULTS: A total of 52222 patients were identified to have stroke / CVA by EMS personnel on arrival at scene. Significant differences were seen in EMS times with accurate identification compared to non-identification of stroke / CVA by dispatch center [41.8 (41.4-52.2) vs 49.8 (49.3-50.2), P = 0.001]. Language and physical barriers at scene were associated with EMS time delays [48.4 (47.3-49.6) vs 45.2 (44.8-45.6), P = 0.001]. EMS times increased from urban to suburban, rural, and wilderness settings [42.6 (42.3-42.9) vs 48.5 (47.6-49.5) vs 50.5 (49.6-51.4) vs 62.4 (59.8-64.9), P = 0.001]. Similarly, Pacific and Mid-Atlantic regions had faster EMS times compared to Mountain regions [35.2 (34.6-35.8) vs 36.5 (35.6-37.4) vs 46.6 (45.4-47.8), P = 0.001]. Winters <65 yrs had less EMS times compared to those aged >65 yrs [44.9 (43.5-45.2) vs 69 (46.4-47.4), P = 0.001].

Conclusion: EMS times in patients with acute stroke are influenced by multiple factors. A better understanding of modifiable and region specific factors can expedite time interval between symptom onset and treatment for acute stroke patients.

# Management and economics
16:00 - 16:15
Intracranial steal phenomenon in Patients with Severe Stenoseclusive Disease of Intracranial Carotid or Middle Cerebral Artery
V.K. SHARMA, A. Ahmad, H.L. Toeh, B.P.L. Chan, C. Ning, T.T. Yu, S.F. Ching, A.K. Sinha National University Hospital, Singapore, SINGAPORE

Background: Intracranial stenosis is associated with stroke recurrence. In severe stenosis, perfusion is maintained by collateral pathways and cerebral autoregulation (CA). CA may be impaired due to inadequate cerebral vasodilatory reserve. Cerebral CRH is detected as transient velocity reduction in affected artery when flow increased in the reference artery. Patients with RRH were further evaluated with acetazolamide-challenged HMPAO-SPECT.

RESULTS: 112 patients (79 males, mean age 57.5 years, range 27-79yrs) with severe intracranial stenosis fulfilled our TCD criteria of inadequate CVR. CRH was detected as transient velocity reduction in affected artery when flow increased in the reference artery. Patients with RRH were further evaluated with acetazolamide-challenged HMPAO-SPECT.
between RRH on TCD and SPECT was noted on ROC curve analysis (area under curve 0.93; 95% confidence interval 0.88-0.98; p=0.001). Linear relationship was noted between TCD steal magnitude and SPECT (Pearson correlation coefficient, r=0.63; p=0.001). Patients with RRHS were at a higher risk of developing recurrent cerebral ischemia (p=0.04; RR 1.7; 95% CI 1.2-3.6).

Conclusions: Intracranial steal phenomenon in patients with severe intracranial stenosis is associated with high risk of cerebral ischemic events. Acetazolamide-challenged HMPAO-SPECT is reliable in the diagnosis of reversed Robin Hood syndrome in patients with severe steno-occlusive disease of intracranial carotid and middle cerebral artery. Identification of RRHS might help in identifying a target group of patients for possible revascularization.

2 Vascular biology
14:45 - 14:50

Heat shock protein 70 reaches secondary lymphoid tissue in stroke patients and correlates with clinical severity
M. Gomez-Choco1, X. Utrera1, F. Maro1, A. Cervera1, A.M. Planas3, A. Chamorro1

Functional Unit of Cerebrovascular Diseases, Hospital Clinic, Barcelona, SPAIN1, Institute for Biomedical Research of Barcelona (IIBB), Spanish Research Council (CSIC), Barcelona, SPAIN2

Background: Heat shock protein 70 (Hsp70) is induced during cerebral ischemia and helps to maintain cellular integrity. Hsp70 can also act as a “danger signal” and induce both innate and adaptive immunity, either activating antigen-presenting cells or through peptide cross-presentation, respectively. During brain injury, different local proteins can reach cervical lymph nodes and palatine tonsils (PT). We sought to determine whether Hsp70 could be increased in stroke patients PT and its relationship with stroke severity.

Methods: We obtained PT biopsies and serum samples from 14 stroke patients within the first 5 days after stroke and 6 control subjects. Demographic, clinical and radiological data were registered. We extracted proteins and RNA from frozen tonsilar tissue for Western blotting (WB) and real-time PCR/RT-PCR studies, respectively. For Hsp70 quantification, the optical density of selected WB bands was measured and normalized by a control protein. RT-PCR was performed to exclude in situ Hsp70 synthesis. Serum Hsp70 was measured using an ELISA commercial kit. Results: Hsp70 expression was increased in PT of stroke patients compared with controls (113.76 ± 0.10 vs. 100.6 ± 0.01, p < 0.01). Hsp70 RNA synthesis was not increased in patients compared with controls.

In patients, Hsp70 expression was inversely correlated with NIHSS score on admission (r = -0.75, p = 0.02), NIHSS day 1 (r = -0.66, p = 0.01), NIHSS day 7 (r = -0.61, p = 0.02), NIHSS day 90 (r = -0.50, p = 0.07), and the volume of the infarction at day 7 (r = -0.66, p = 0.01). Yet, the expression of Hsp70 was not correlated with the mRS at day 90 (r = -0.45, p = 0.10). In contrast, serum Hsp70 was not correlated with either stroke severity stroke or infarct volume.

Conclusions: Hsp70 reaches stroke patients secondary lymphoid tissue and could play a role in immune response against cerebral antigens. PT Hsp70 shows a better correlation with stroke severity than serum Hsp70.

3 Vascular biology
14:58 - 15:00

MBL-deficiency is associated with lower microparticle procoagulant activity after acute ischemic stroke: clinical evidence of activation of the coagulation cascade by the lectin pathway of complement
A. Carreira1, D. Tassiez1, A.M. Planas1, J.C. Reverter1, X. Utrera1, F. Lazaro1, M.T. Arias1, A. Chamorro1

Comprehensive Stroke Center, Hospital Clinic, Barcelona, SPAIN1, Department of Hemotherapy and Hemostasis, Hospital Clinic, Barcelona, SPAIN2, Department of Brain Ischemia and Neurodegeneration, Institut d’Investigacions Biomèdiques de Barcelona-CSIC, Barcelona, SPAIN3, Immunology Department, Hospital Clinic, Barcelona, SPAIN4

Background: Mannose-binding lectin (MBL) has been implicated in brain damage after ischemia-reperfusion and MBL-deficiency is associated with lower microparticle procoagulant activity after acute ischemic stroke. We aimed to investigate the procoagulant activity of microparticles (MP) in the brain tissue and in serum samples of stroke patients with MBL deficiency.

Methods: A cohort of 294 ischemic stroke patients treated with reperfusion therapies was analyzed. All had a record of risk factors, clinical and laboratory variables, and outcome at 3 months. MBL genotype was assessed using a Taqman assay. MP procoagulant activity was measured using a CL FloPro® kit. Serum MBL levels were measured using an ELISA commercial kit.

Results: MBL-deficient patients (15.8%) had higher baseline MP procoagulant activity (p=0.01). MP procoagulant activity was increased in MBL-deficient patients compared with controls (41.5 ± 13.2 vs. 17.4 ± 2.1, p=0.01). In a linear regression model the procoagulant activity of MP in stroke looking for differences according to MBL status was independently associated to MBL genotype.

Conclusion: The procoagulant activity of MP increases after ischemic stroke. Lower procoagulant activity of MP in MBL-deficient patients indicates a lower degree of hypercoagulability and tends to be associated with less neurological impairment. The results support the experimental evidence that links the lectin pathway of complement with the coagulation cascade.

4 Vascular biology
15:00 - 15:10

Effects of statins on matrix metalloproteinases and their inhibitors in a human endothelial in-vitro stroke model
B. Bouter1, C. Rodemer1, S. Graf1, S. Meairs1, P. Bugert2, M.G. Hennerici1, M. Fatar1

Department of Neurology, University of Heidelberg, Mannheim, GERMANY1, Institute of Transfusion Medicine and Immunology, Universidad de Heidelberg, Mannheim, GERMANY2, Institute of Transfusion Medicine and Immunology, Universitätsmedizin, University of Heidelberg, Mannheim, GERMANY3

Background: Matrix metalloproteinases (MMPs) are key players in blood-brain barrier (BBB) breakdown during ischemic stroke (IS). Their effect is dampened by the tissue inhibitor of metalloproteinases (TIMPs). The cellular source of MMPs and TIMPs during BBB breakdown is still under investigation. We analyzed the MMP and TIMP release of human brain microvascular endothelial cells (BMECs) under oxygen glucose deprivation (OGD) and the effect of statin therapy. Methods: Cultured human BMECs were subjected to OGD (6, 12, 18 and 24 hrs). Gene expression of MMP-2, MMP-9, TIMP-1 and TIMP-2 were serially measured by real-time quantitative PCR and compared to ELISA detected supernatant levels. Secondly, the expression and release were analyzed after pretreatment with simvastatin 5 µmol/L for 24 hrs and 24 hrs of OGD.

Results: OGD induced a strong increase in MMP-2 gene expression (p<0.001). Medium levels of MMP-2, TIMP-1 and TIMP-2 started a simultaneous increase in OGD. Expression and secretion of TIMP-1 declined under OGD (p=0.001), whereas TIMP-2 remained stable. After 12 hrs of OGD the medium levels of MMP-2, TIMP-2 and TIMP-2 started a simultaneous increase in OGD. Expression and secretion of TIMP-1 declined under OGD (p=0.001), whereas TIMP-2 remained stable. After 12 hrs of OGD the medium levels of MMP-2, TIMP-2 and TIMP-2 started a simultaneous increase in OGD.

Conclusions: The procoagulant activity of MP increases after ischemic stroke. Lower procoagulant activity of MP in MBL-deficient patients indicates a lower degree of hypercoagulability and tends to be associated with less neurological impairment. The results support the experimental evidence that links the lectin pathway of complement with the coagulation cascade.
Increased thrombin generation potential in symptomatic versus asymptomatic moderate and severe carotid artery stenosis - Results from the Platelets And Carotid Stenosis (PACS) Study
The Adelaide and Meath Hospital, Dublin, incorporating the National Children’s Hospital, Trinity College Dublin, Ireland, Dublin 24, IRELAND, Department of Age-Related Health Care, The Adelaide and Meath Hospital, Dublin, incorporating the National Children’s Hospital, Trinity College Dublin, Ireland, Dublin 24, IRELAND, Department of Vascular Surgery, St James Hospital, Trinity College Dublin, Dublin 8, IRELAND

Introduction: Thrombin generation parameters were assessed in symptomatic patients with matched data at both after phases of symptom onset. Results: Data from 31 asymptomatic, 46 early phase symptomatic and 35 late phase symptomatic patients (23 of whom had undergone carotid intervention) were analyzed. Peak thrombin (344.2 vs. 305.3M; p=0.01) and ETP (1772.4 vs. 1589.7; p=0.047) were higher in early than asymptomatic patients. Peak thrombin (338.3 ± 299.5M; p=0.002) and ETP (1708.4 ± 1528.6 M; p=0.04) were elevated in early severe versus symptomatic moderate. Thrombin peak production decreased in symptomatic patients followed up from the early to late phase after symptoms (339.7 ± 70.3M; p=0.002). Discussion: Patients with recently symptomatic moderate or severe carotid stenosis have increased thrombin generation potential compared with those with their asymptomatic counterparts. The thrombin generation potential decreases over time following TIA or stroke associated with extracranial carotid stenosis. Further longitudinal studies are warranted to assess the prognostic value of haemostatic/thrombotic biomarkers at predicting the risk of stroke recurrence in asymptomatic and symptomatic carotid stenosis.

Glycogen Phosphorylase BB Levels are Elevated in Acute Ischemic Stroke J.A. CACERES, O. PONTES NETO, R. A. VERY, S. LORENZANO, K.L. FURIE, H. AYER
The Adelaide and Meath Hospital, Dublin, incorporating the National Children’s Hospital, Trinity College Dublin, Ireland, Dublin 24, IRELAND, Department of Age-Related Health Care, The Adelaide and Meath Hospital, Dublin, incorporating the National Children’s Hospital, Trinity College Dublin, Ireland, Dublin 24, IRELAND, Department of Vascular Surgery, St James Hospital, Trinity College Dublin, Dublin 8, IRELAND

Introduction: von Willebrand factor propeptide (VWF:Ag) is believed to be a more sensitive marker of acute endothelial cell activation than von Willebrand factor antigen (VWF:Ag), because VWF:Ag II has a shorter plasma half-life. VWF:Ag and VWF:Ag II levels have not been comprehensively assessed in symptomatic and asymptomatic carotid stenosis patients. Methods: Plasma VWF:Ag II and VWF:Ag levels in patients with moderate or severe (≥50%) asymptomatic carotid stenosis were compared with those from symptomatic carotid stenosis patients in the early (≤4 weeks) and late phases (≥3 months) after TIA or stroke in a multicentre, observational study. We assessed the longitudinal thrombin generation profile in symptomatic patients with data in both the early and late phases after symptom onset. Seventy-three asymptomatic and symptomatic patients were included. Results: VWF:Ag II levels increased significantly in early symptomatic patients compared with their asymptomatic counterparts (10.9mg/mL; p=0.023) vs. severe asymptomatic carotid stenosis (8.8mg/mL). VWF:Ag levels decreased significantly in symptomatic patients followed up from the early to late phase after symptoms (4.5mg/mL; p=0.004) vs. early asymptomatic patients. Conclusion: The addition of dipyridamole to aspirin led to a persistent reduction in peak and total thrombin generation ex-vivo, and illustrates the diverse, potentially beneficial, newly recognised 'anti-coagulant' effects of dipyridamole in carotid ischemic CVD. This pilot study did not show any consistent effects of commencing aspirin, or of changing from aspirin to clopidogrel on coagulation system potential during follow-up.

Immunophenotype of silent brain infarction and lacunar stroke K.N. SANCHEZ, F. FISCH, P. CALABRESI, L. PARMENTI
Medical Neurology and Clinical Sciences of Special Care, The Adelaide and Meath Hospital, Dublin, incorporating the National Children’s Hospital, Trinity College Dublin, Ireland, Dublin 24, IRELAND, Department of Age-Related Health Care, The Adelaide and Meath Hospital, Dublin, incorporating the National Children’s Hospital, Trinity College Dublin, Ireland, Dublin 24, IRELAND, Department of Vascular Surgery, St James Hospital, Trinity College Dublin, Dublin 8, IRELAND

Background: Glycogen phosphorylase BB (GPBB), a key regulator of glycogen metabolism primarily found in the brain and heart that catalyzes the rate-limiting reaction in the degradation of glycogen in response to ischemia. We conducted a pilot study to test the hypothesis that plasma levels of GPBB are elevated in acute ischemic stroke patients and can be used as a diagnostic aid in AIS.

Materials and methods: We selected 49 samples from a cohort of consecutive AIS patients enrolled in a prospective biomarker study. Subjects with a confirmed diagnosis of AIS by neuroimaging and with collected blood samples within 9 hours from symptom onset were included. A second control group of 48 healthy individuals were collected. We included anterior and posterior circulation strokes but excluded lacunar samples. Samples were analyzed using a commercially available GPBB-ELISA test kit. The upper reference limit of the assay was 10 ng/mL.

Results: We found a trend of increased plasma levels of GPBB in ischemic stroke patients compared to healthy controls (71.6 ± 38.6ng/mL vs. 38.8 ± 15.7ng/mL, p=0.052). Area under the ROC curve for GPBB was 0.71 (95% CI 0.54-0.91). The predicted value of GPBB above the cut-off of 55.1ng/mL was 84.5% for identifying a potential ischemic stroke with a negative predictive value of 99.1% and positive predictive value of 35.2%.

Conclusion: Plasma GPBB levels are elevated in acute ischemic stroke and appear to be a potential biomarker for identifying potential ischemic stroke with high negative predictive value. Further studies are needed to explore the predictive value of GPBB in identifying a potential ischemic stroke in the acute phase.

BACKGROUND: The presence of contrast extravasation following CT angiography (CTA), the spot sign, predicts hematoma expansion and poor clinical outcome in patients with primary intracerebral hemorrhage (ICH). The biological underpinnings of the spot sign remain poorly understood, and there are no established risk factors for its presence. We conducted a prospective, short study to identify determinants of the CTA spot sign.

METHODS: Consecutive primary ICH patients who underwent CTA and CTA at presentation were included in this analysis. CTAs were reviewed by two experienced readers according to previously published validated criteria.

APOE genotype and common clinical covariates were analyzed for association with spot sign presence. Analyses were stratified by deep, lobar and probable / definite cerebral amyloid angiopathy (CAA) related ICH (by Boston criteria).

RESULTS: Of 372 patients, 151 had deep, 198 had lobar and 23 had mixed ICH. We identified at least 1 spot sign in 96 of 372 patients (25.8%). In multivariate analysis, patients on warfarin were more likely to have a spot sign (OR 2.64 [95% CI 1.13-5.23]). Patients with the APOE e2 allele were more likely to have a spot sign (OR 2.09 [95% CI 1.05-4.20], p = 0.036). There was no effect for patients with the APOE e4 allele.

Conclusion: Patients on warfarin are more likely to have a spot sign, regardless of the location of the ICH. Among patients with lobar ICH, those who possess the APOE e2 allele are more likely to have a spot sign. Given the established relationship between APOE e2 and vasculopathic changes in CAA, our findings suggest that both hemostatic factors and vessel pathology influence spot sign presence and risk of prolonged bleeding in ICH.

1 Intracerebral/subarachnoid haemorrhage and venous diseases B
16:30 - 18:00

The Glasgow Coma Scale alone performs as well as or prognostic scoring systems for predicting 30-day mortality in a large cohort of patients with acute intracerebral haemorrhage A.R. Parry-Jones, K. Abd, C.J. Smith2, A. Vail, P.J. Tyrrell

The University of Manchester, Manchester, UNITED KINGDOM1, Salford Royal NHS Foundation Trust, Salford, UNITED KINGDOM2

Background: A number of prognostic scores to predict survival after intracerebral haemorrhage (ICH) have been described, including the ICH score, the modified ICH score (MICH) and the ICH grading scale (ICH-GS). We aimed to test how well these scores predicted survival in a large, prospective cohort of patients.

Methods: 1,164 ICH cases were referred to our centre from 1/1/08 to 17/10/10. Clinical details, including sex, age, and Glasgow Coma Scale (GCS), were prospectively recorded and the first CT brain scan after presentation was retrospectively reviewed to determine ICH volume (ARC2 method) and hematoma expansion was assessed using semi-automated software. Expansion was defined as an increase in volume of >25% or an increase of >33% from baseline ICH volume.

RESULTS: Hematoma expansion occurred in 18% of the 1,164 patients. Mortality was 41.3% at 30 days and 52.4% at 1 year. All 3 scores and GCS divided cases into groups with highly significant differences in mortality (p<0.0001; log-rank test). The area under the ROC curve (AUC) was very similar for the ICH score (0.863; 95% CI, 0.841 – 0.885), ICH-GS (0.872; 95% CI, 0.851 – 0.893), and the MICH score (0.859; 95% CI, 0.837 – 0.881). The GCS alone performs as well as the scores (Figure: AUC 0.871; 95% CI, 0.849 – 0.892). ICH volume was less predictive (AUC 0.776; 95% CI, 0.749 – 0.803), and age very much less predictive (AUC 0.570; 95% CI, 0.537 – 0.603), than GCS or the scores.

Conclusions: Though existing prognostic scores are highly predictive of 30-day mortality, GCS alone was as good in our cohort. The negligible influence of age on 30-day mortality suggests this variable should be given minimal weight when prognosticating. Providing patients and their families with a personalised assessment of prognosis after ICH is important and GCS alone may provide this with reasonable accuracy.

2 Intracerebral haemorrhage and venous diseases B
16:30 - 18:00


Massachusetts General Hospital, Harvard Medical School, Boston, USA

BACKGROUND: Hematoma expansion after acute intracerebral hemorrhage (ICH) occurs most frequently in patients presenting within 3 hours of symptom onset. Therefore, most investigational therapies have been tested only in patients presenting ultra-early in their disease course. However, the majority of ICH patients present outside this time window or with an unknown time of onset. We investigated the prevalence of hematoma expansion in those patients with delayed presentation and assessed the accuracy of the CT angiography (CTA) spot sign for identifying risk of hematoma expansion.

METHODS: We performed a prospective cohort study. 391 consecutive ICH patients undergoing CTA and followup head CT were enrolled over ten years. CTA spot sign readings were performed by two experienced readers and hematoma expansion was assessed using semi-automated software. Expansion was defined as an increase in volume of >6 mL or an increase of >33% from baseline ICH volume.

RESULTS: Hematoma expansion occurred in 18% of the 391 patients. When stratified by time from symptom onset to initial CT scan, hematoma expansion rates were: 39% within 3 hours, 11% between 3 – 6 hours, 11% between 6-12 hours (but with known onset), and 20% in patients with an unknown symptom onset time. Of all patients who developed hematoma expansion, only 38% presented within 3 hours of symptom onset. The accuracy of the spot sign in predicting hematoma expansion was 0.67 for patients presenting within 3 hours, 0.83 between 3 to 6 hours, 0.68 after 6 hours and 0.76 for patients presenting with an unknown onset time.

CONCLUSIONS: A substantial number of patients destined to suffer from hematoma expansion present either late or with an unknown time of symptom onset. The CTA spot sign accurately identifies patients destined to expand regardless of time from symptom onset, and may therefore open a path to offer clinical trials and novel therapies to the many patients who do not present within 3 hours of symptom onset.
Table 1: Spot sign presence in deep, lobar and cerebral amyloid angiopathy-related ICH

*

Analysis is also adjusted for MDS PC1 and PC2
** By Boston criteria
ICH = Intracerebral Hemorrhage; CAA = Cerebral Amyloid Angiopathy; OR = Odds Ratio; 95% CI = 95% Confidence Interval; APOE =Apolipoprotein E
4 Intracerebral/subarachnoid haemorrhage and venous diseases B
17:00 - 17:10
Late seizures in a cohort of patients with intracerebral haemorrhage: incidence and predictors
C. Rossi1, V. De Herdt2, N. Dequatre-Ponchelle1, H. Hénon1, D. Leys1, C. Cordonnier1,
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Pintelaan 185, B-9000 Gent, Belgium, Ghent, BELGIUM2
Background: in patients with spontaneous intracerebral haemorrhage (ICH), factors related to the occurrence of late seizures (LS) are still poorly understood. Therefore, we aimed at identifying incidence and predictors of LS in
a cohort of ICH patients.
Methods: Between 11/04 and 03/09, we prospectively recruited 562 consecutive adults with a spontaneous ICH. Patients who died within 7 days after stroke onset (n=197) or who had history of seizures before stroke (n=40)
were excluded. LS were defined as seizures occurring beyond one week of stroke. We performed survival analyses using life tables and Kaplan-Meier statistics. Incidence and predictors were identified with Cox regression. We
included a multivariate analysis on MRI biomarkers [brain microbleeds (BMB), leukoaraiosis, cerebral atrophy], adjusted for vascular risk factors.
Results: we recruited 325 patients (176 males, 54% 95%CI 49 to 60) with a median age of 70 years [interquartile range (IQR) 58-79]. During 778 person-years of follow-up [median follow-up 2.2 years (IQR 0.97 to 4.31)],
31 patients developed at least one LS, resulting in an incidence rate of 4 (95%CI 3 to 6) new cases/100 person-years. The median delay between ICH and LS was 9 months (IQR 3 to 23). Factors independently associated with
the occurrence of LS were a cortical involvement of the ICH [Odds Ratio (OR) = 3.4; 95%CI 1.5 to 7.5] and the presence of diabetes mellitus (OR = 2.7; 95% CI 1.1 to 6.5). Concerning MRI biomarkers, multivariate analyses
found lobar BMB to be independent predictors of LS (OR 2.4; 95%CI 1.0-5.4), especially the presence of 3 or more (OR 2.7; 95% CI 1.1-6.8).
Conclusion: LS generally occur more than 6 months after ICH onset, imposing a long-term follow-up. The role of lobar BMB (especially the presence of 3 or more) as predictors of LS might suggest a link with the underlying
vascular disease (cerebral amyloid angiopathy).
5 Intracerebral/subarachnoid haemorrhage and venous diseases B
17:10 - 17:20
Antiplatelet pretreatment predicts delayed rebleeding among CTA spot sign negative patients with acute intracerebral hemorrhage Antiplatelet pretreatment predicts delayed rebleeding among CTA spot sign negative patients with acute intracerebral hemorrhage
D. Rodriguez-Luna1, S. Piñeiro1, M. Rubiera1, P. Coscojuela2, J. Pagola1, A. Flores1, B. Ibarra2, M. Hernandez-Guillamon1, M. Ribo1, F. Romero2, J. Alvarez-Sabin1, J. Montaner1, C.A. Molina1
Stroke Unit, Hospital Universitari Vall d’Hebron, Barcelona, SPAIN1, Neuroradiology Department, Hospital Universitari Vall d’Hebron, Barcelona, SPAIN2
Background: The CTA spot sign is an indicator of active bleeding in patients with acute intracerebral hemorrhage (ICH) and has been shown to be a powerful predictor of hematoma growth (HG). However, patients without
spot sign may present HG, suggesting a delayed rebleeding. We aimed to investigate variables related to HG in CTA spot sign negative patients that could act as indirect predictors of subsequent rebleeding.
Methods: We prospectively studied 129 patients with primary supratentorial ICH presenting within 6 hours from symptoms onset. Patients underwent baseline (<6 hours) and 24-hour CT scans, and a CTA (<6 hours) for the
detection of the spot sign. All CT and CTA scans were evaluated prospectively by a blinded neuroradiologist. The CTA spot sign was used as marker of active bleeding. HG was defined as ICH enlargement >33% or >6mL at 24
hours.
Results: The CTA spot sign was present in 23.3% (30/129) of patients. HG at 24 hours occurred in 39% (48/123) of patients: 66.7% (18/27) in CTA spot sign positive group vs. 31.3% (30/96) in CTA spot sign negative group
(p=0.001). Variables associated with HG in the CTA spot sign negative group were older age (73.8±12.8 vs. 68.1±12.8 years, p=0.045), antiplatelet pretreatment (24.1% vs. 7.6%, p=0.025), higher creatinine levels (1.03±0.45
vs. 0.82±0.23 mg/dL, p=0.034), and larger baseline ICH volume (11.9 [7.6-27] vs. 8.8 [4.5-15.2] mL, p=0.027). None of them were significantly related to HG in CTA spot sign positive group. In multivariable logistic regression analysis, antiplatelet pretreatment (OR 4.74, 95% CI 1.25–18, p=0.022) and age >74 years (OR 3.75, 95% CI 1.43–9.8, p=0.007) emerged as independent predictors of HG in CTA spot sign negative patients.
Conclusions: In acute ICH patients without the CTA spot sign on admission, antiplatelet pretreatment and age >74 years independently predict delayed rebleeding and HG.
6 Intracerebral/subarachnoid haemorrhage and venous diseases B
17:20 - 17:30
Blood Pressure Elevation in the First Three Hours after Onset is Related to Early Expansion of Intracerebral Hemorrhage
N. Sanossian1, A.M. Burgos1, D.S. Liebeskind2, L. Groysman1, J.P. Villablanca2, R. Conwit3, M. Eckstein1, F.D. Pratt4, S. Stratton2, S. Hamilton5, S. Starkman2, J.L. Saver2
FAST-MAG Investigators and Coordinators
University of Southern California, Los Angeles, USA1, UCLA Stroke Center, Los Angeles, USA2, NIH, Bethesda, USA3, Los Angeles County Fire Department, Los Angeles, USA4, Stanford University, Palo Alto, USA5
Background: Intracerebral hemorrhage (ICH) expansion is associated with elevations in blood pressure. It is unclear how the early course of BP elevation varies among individuals who undergo ICH expansion and those who
do not.
Methods: Consecutive subjects with ICH enrolled in Field Administration of Stroke Therapy Magnesium (FAST-MAG) had BP recorded in the field (pre), emergency department (ED) arrival, and at .25, 1, 4, 8, 12, 16, and 24
hours after arrival. Baseline and follow-up imaging were analyzed by 2 neurologists for ICH volume using ABC/2 method. ICH expansion was defined as volume increased by >33% and/or 12.5 ml.
Results: Among 105 ICH patients, mean age 67 (SD 14) years, 28% women, 36% Hispanic and 83% white race. Pre BP assessment occurred at a median of 23 (IQR 16, 39) minutes after onset and ED arrival BP assessment at
60 (IQR 50, 77) min after onset. First scan occurred at 93 (IQR 77, 115) min after onset and follow-up at 21 (IQR 5, 42) hours after initial scan. Mean initial ICH volume was 17.3 (SD 17) ml, follow-up 28.7 (SD 36) ml, an absolute increase of 11.4 (SD 27) ml. Expansion occurred in 37 (35%). Mean pre (SBP 183 vs 174, p=0.079, DBP 101 vs 97, p=0.249) and ED arrival (SBP 185 vs 175, p=0.170, DBP 101 vs 92, p=0.048) trended higher in those
with expansion. BP at 15 minutes and 1 hour after arrival was higher with expansion (15 min: SBP 183 vs 172, p=0.071, DBP 96 vs 91, p=0.17; 1 hr: SBP 180 vs. 162, p=0.005, DBP 92 vs 81, p=0.011). From 4 to 24 hours after arrival, there was no significant difference in BP in the two groups (4 hours 149/79 vs 153/75, 8 hours 138/71 vs 144/70, 12 hours 135/69 vs 141/69, 16 hours 138/70 vs 141/69, 24 hours 134/71 vs 140/72).
Conclusions: Patients with expansion of ICH had elevated BP in the first three hours after onset, but not at later assessments. These findings suggest that antihypertensive therapy aimed at deterring hematoma expansion will
need to be delivered hyperacutely to have a potential benefit.
7 Intracerebral/subarachnoid haemorrhage and venous diseases B
17:30 - 17:40
Continuous blood pressure monitoring in patients with acute intracerebral hemorrhage
C. Sick, M. G. Hennerici
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BACKGROUND: Although blood pressure (BP) monitoring is a standard in patients admitted to stroke units, data analysis has been limited to excessively high or low values individually. We report a new insight to extensive
data collection in a series of patients monitored within 72h after stroke onset.
METHODS: Over 44.000 measurements for systolic (sBP), diastolic (dBP), mean arterial BP (mBP) and BP amplitude (BPAmp), obtained from 367 patients with intracerebral hemorrhage (ICH), were divided into 2h intervals and averaged. ICH was classified by location, intraventricular hemorrhage (IVH/non-IVH), midline shift (no: non-MS, ≤5mm: MS<5, >5mm: MS>5) and volume (<5ml: V5, 5-20ml: V5-20, >20ml: V20). RESULTS: sBP,
dBP, mBP and BPAmp reached maximum after 2-4h (164±3.7; 89±2.6; 118±3.5; 74±2.6) and decreased significantly (p<0.01) to a minimum 8h later (141±2.7; 74±1.7; 100±2.3; 65±1.8). Starting with higher peak values locotypico ICH did not show significant higher sBP, dBP and mBP until 12h after onset (Fig.1). IVH-patients showed initial increase of sBP with significant higher values lasting longer after onset than in non-IVH-patients (Fig. 2).
Incipient with highest sBP, dBP and mBP values (180±12.8; 96±14.3; 128±17.1) MS>5 patients showed a minimum 6h later (141±5.3; 74±3.2; 100±4.2), being significant (p<0.05) smaller than for non-MS (152±3.4; 85±2.5;
111±3.0) and MS<5 (156±3.6; 152±2.6; 109±3.2). BPAmp was significant higher for IVH than for non-IVH (Fig. 2). Starting 10h after onset this also applies to MS>5 vs. non-MS as well as to V20 vs. V5.
CONCLUSION: Large patient group analysis of sBP, dBP, mBP and BPAmp in stroke patients allows better insight in disease related BP changes. Patients with ICH showed maxima after 2-4h, a subsequent decrease and a
minimum 8h later. Significant higher sBP and BPAmp were seen in IVH and ICH with MS. These BP profiles provide useful keys for classification, estimation of prognosis and management modifications in future studies.

Lisbon, Portugal 2012

21. European Stroke Conference

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Acute blood pressure lowering in the first 6 hours following intracerebral hemorrhage is associated with acute infarcts on MRI

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Rush University Medical Center, Chicago, USA

Background: Secondary ischemic injury after intracerebral hemorrhage (ICH) has been recently described, though its causes and relationship to outcomes remain uncertain. We evaluated the relationship between blood pressure (BP) lowering and occurrence of acute ischemic lesions on brain MRI following ICH.

Methods: We reviewed consecutive patients with ICH from March 2009 to April 2011 with the following criteria: 1) spontaneous ICH without secondary etiologies and 2) completion of brain MRI within 14 days of admission. Patients who underwent conventional angiography or craniotomy prior to MRI were also excluded. Serial BP measurements and clinical data were retrieved from an electronic database. Diffusion-weighted imaging (DWI) was reviewed for presence of restricted diffusion. We analyzed the relationship between BP parameters in the first 6 hours following admission and DWI lesions on MRI. P-values < 0.05 were considered significant.

Results: One-hundred forty-two spontaneous ICH patients (mean age 62 years; 52.8% female; 60.6% black; median time to MRI 1 day) were analyzed. Of these, 23 (16.2%) had DWI lesions present. The mean initial systolic blood pressure (SBP) and change in SBP from baseline to lowest recorded in the first 6 hours were higher in those with DWI lesions compared to those without (admission: 201 vs. 184 mmHg; p=0.04; change: 74 vs. 56 mmHg; p=0.05). Those who achieved > 30% relative lowering of SBP within 6 hours were 2.7-fold more likely to have DWI lesions than those did not (22.9 vs. 9.7%, p=0.03).

Conclusion: Among spontaneous ICH patients, higher baseline SBP and greater relative lowering of BP in the first 6 hours after presentation is associated with secondary ischemic injury on MRI. These data suggest that a subset of ICH patients may require careful BP titration to avoid cerebral hypoperfusion.

Hyperacute Blood Pressure Course in Relation to Early Clinical Deterioration in Intracerebral Hemorrhage

FAST-MAG Investigators and Coordinators
University of Southern California, Los Angeles, USA, UCLA Stroke Center, Los Angeles, USA, National Institutes of Health, Bethesda, USA, Los Angeles County Fire Department, Los Angeles, USA, Stanford University, Palo Alto, USA

Background: We have previously shown that an elevation in first blood pressure measurement in intracerebral hemorrhage (ICH) is associated with prehospital and ultra-early clinical deterioration (CD). We sought to determine whether changes in BP during the prehospital course are associated with deterioration.

Methods: Consecutive subjects enrolled in the NIH-funded FAST-MAG (FM) clinical trial with ICH on initial imaging were selected. All had BP and Glasgow Coma Scale (GCS) by paramedics prior to enrollment. First and repeat GCS BP in the emergency department (ED) were recorded. CD was defined as a worsening of >= 2 points on the GCS in between the prehospital and emergency room evaluation. Clinical, demographic, and initial radiographic data were compared in those with and without deterioration. Last known well time (LKWT) was confirmed by FM study nurse in the ED.

Results: Out of 1119 consecutive cases, there were 258 ICH patients (23%) with a mean age of 65 (SD 14) years, 32% were women, 32% had Hispanic ethnicity and 80% white race. BP was much higher in those with ICH at both prehospital (176/100 vs 156/87, p<0.001) and ED arrival (178/96 vs 155/82, p<0.001). There were 79 cases of clinical deterioration (44%) among ICH. Those who deteriorated had significantly higher hospital arrival SBP (185 vs 175, p=0.012) but not prehospital SBP (180 vs 174, p=0.09), DBP 101 vs 99, p=0.48 or arrival DBP (98 vs 95, p=0.20). Those who deteriorated had an increase in SBP of 5.3 (vs 3.6, p=0.10). Considering highest recorded blood pressure (higher of prehospital and ED arrival), those who deteriorated had increased SBP (194 vs 185, p=0.008) but not DBP (107 vs 104, p=0.18).

Conclusions: ICH patients who clinically deteriorate in the prehospital period have higher systolic blood pressure on ED arrival than patients who are clinically stable. Prehospital clinical deterioration may be a consequence of hematoma expansion due to continued elevation in BP.
Molecular profiling of the peri-infarct region dynamics in cerebral ischemia

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Background. The peri-infarct region is a key target for stroke treatment. Such region is conceptually different from the ischemic penumbra, and has different extension and temporal evolution. Its definition cannot be based on the same imaging criteria. In this work we report the identification of specific molecular markers for the peri-infarct tissue in stroke, following their spatiotemporal evolution up to 14 days.

Methods. Intraluminal transient (90 min) or permanent occlusion of the MCA of SD rats was used as models of ischemia. Lesion evolution was followed by MRI studies at 9.4 T. Molecular markers of peri-infarct tissue were identified by proteomic studies of brains from ischemic rats, performed by 2D-PAGE and COFRADIC techniques. Proteins were identified by mass spectrometry, and markers were confirmed by western-blots and immunohistochemical analyses.

Results. Our proteomic study provided 15 suitable candidates as molecular markers of peri-infarct tissue, all highly over-expressed on that region (HSP70 family was the most expressed one). However, the influence of such strategy was not investigated in the context of an intracerebral hemorrhage (ICH). Thus, the aim of our present study was to investigate the effects of the αATD-GluN1 in a rat model of ICH.

Methods. ICH in the right striatum was induced by collagenase injections in 30 rats. Rats received a single injection in the tail vein of either saline (n=15) or purified αATD-GluN1 (n=15) one hour after ICH onset. 72 hours later, rats were euthanized and brain water content assessed using a deoscent methods.

Results. We have first observed that αATD-GluN1 treatment had no impact on hemorrhage volumes: 119.3±21.5 mm³ in the saline group versus 125.2±23.9 in the αATD-GluN1 treated group (p=0.6). However, αATD-GluN1 treatment led to a reduced brain edema in the lesioned hemisphere after ICH (from 84.5±16.9 % vs. 83.8±12.2 %, p=0.038). Accordingly, αATD-GluN1 treatment significantly improved functional recovery (neurobehavioral scores: 0.5 for the αATD-GluN1 treated group versus 1.6 for the saline group, p<0.0009; activity: 159.5±11.3 movements in 10 minutes time period (mov/10 min) for the αATD-GluN1 treated group versus 101.4±12.3 mm/min (10 min) for the saline group, p<0.028). Conclusion. Although αATD-GluN1 has no impact on hemorrhage growth by itself, it significantly reduces the associated brain edema and subsequent neurological deficits. These initial data suggest that αATD-GluN1 could potentially be injected even before a definitive diagnosis is made to distinguish ischemic versus hemorrhagic stroke. However, these experimental results require clinical confirmation.
TLR4 DECREASES BRAIN CELL PROLIFERATION AFTER EXPERIMENTAL STROKE. M. Oues, A. Moraia, V.G. Roman, J.M. Padillo1, I. García-Yébenes1, M. Hernández-Jiménez2, P. Negrero,3 M.A. Moro, I. Lizasoain4

Neurovascular Research Unit. Complutense Medical School, Madrid, Spain, 5PAF1, Faculty of Life Sciences, University of Manchester, Manchester, UNITED KINGDOM; Morphology Department. Autonoma Medical School, Madrid, Spain

Background: Specific innate immunologic response starts after stroke that is mediated through toll-like receptors (TLR). TLR4 has been implicated in the brain injury caused by stroke (Cao et al., Circulation 2007). In addition, TLR4 has been also involved in hippocampal neuron under neurogenic conditions (Rolls et al., Nature Cell Biol 2007). However, it is unknown the role that TLR4 plays on a cell proliferation. Our objective is to determine the role of TLR4 after stroke.

Methods: Focal ischemia was induced by permanent occlusion of the trunk of the middle cerebral artery (MCAO). It was performed on WT mice (C57BL/10ScNJ) and anti-TLR4 blockade (C57BL/10ScNf4). MCAO was conducted in 10 strokes in each site to three different mice groups: WT, TLR4-/- and vehicle. For the experimental group, TLR4 on cell proliferation excluding bias due to different infarct volume, we performed -on control mice- a brain section of the MCA to obtain infarct sizes similar to those in the KO mice. Thus, we did not find any difference in the infarct volume after stroke between WT-brain and KO-brain groups. In those groups, we findings reveals that after stroke, deficiency of TLR4 promotes cell proliferation, increasing the number of BrdU+ cells in the ipsilateral SVZ at 7-days. We did not find any difference in the number of BrdU+ and the number of microglial (B2+) cells in the cortex. Finally, we have observed that in control mice, cell proliferation is dependent on infarct size, since WT-tbrunk group had larger proliferation when compared with WT-brain group. Our results describe that after the stroke TLR4 promotes cell proliferation. Our data suggest that TLR4 not only mediates brain damage in the acute phase but also might decrease neurorepair mechanisms during the chronic phase of stroke.

Cerebral Ischaemia and Matrix Metalloproteinase-9 Modulate the Angiogenic Function of Endothelial Progenitor Cells


Background. Endogenous angiogenesis after stroke will be critical in neurorepair therapies in which endothelial progenitor cells (EPCs) might be key players. Our aim was to determine the influence of cerebroischaemia and the role of matrix metalloproteinase-9 on the angiogenic function of EPCs.

Methods: Permanent ischaemia was induced by occlusion of the MCA in MMP9 knockout (MMP9 KO) and corresponding wild-type (WT) mice. Non-ischaemic controls were also studied. EPCs were obtained at different time point (24, 48, 72 and 120) hours after cerebroischaemia for cell counting. Plasma samples were obtained to determine the level of pro-angiogenic factors by multiple ELISA. Matrigel assays and in vivo time-lapse imaging were carried out to monitor endothelial function of the EPCs.

Results: Cerebral ischaemia increased the number of EPCs in MMP9 KO mice (p< 0.05). MMP9 deficiency decreased the number of EPCs in control and 6h ischaemic mice (p=0.031 and p=0.021), after 24h of ischaemia KO mice had the same number of EPCs than WT. EPCs from ischaemic WT mice (24h) were more functional than from controls, increasing the number of vessel structures in matrigel assay (p=0.007 for WT and p=0.05 for KO). Interestingly, MMP9 deficiency reduced the angiogenic abilities of EPCs since less vessels structures and periphery were shaped by control (p=0.059 and p=0.036) and ischaemic (p=0.059 and p=0.003) EPCs. MMP inhibitor treatment also decreased the number of vessel structures shaped by both humans and WT EPCs (p=0.05). Time-lapse imaging replicated those patterns and showed a maximum of vessel structures already formed at 8h with a dynamic and sustained cell proliferation until 24h. Finally, increased to plasma VEGF and KDR level was detected at 8h after ischaemia in WT mice (p<0.05). KO mice showed increased plasma levels of PDGF-BB and VEGF 24h after ischaemia vs. WT at p=0.05 respectively.

Conclusion: Ischaemia triggers the angiogenic responses of EPCs. In this context MMP9 plays a key role and its modulation may be important to improve neurorepair.

The Aryl Hydrocarbon Receptor Participates in Ischemic Brain Damage


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Background: The aryl hydrocarbon receptor (AhR) is a ligand-activated transcription factor that mediates metabolism and toxicity of xenobiotics and physiological processes such as cell cycle regulation and immunomodulation.

Methods: To determine the role of AhR after stroke, cingulum bundle of the MCA was damaged in C57BL/6 wild-type (WT) and AhR+/- male mice (kindly donated by Dr. P. Fernández-Salguero) were exposed to MCAO. An additional group was treated with either an AhR antagonist (6,2’,4’-trimethoxy-methyl-m-[thiophen-2yl]-pyridine, TMT). TMR scanning was performed at different time points (24, 48, 72h and 1 week) post-ischemia.

Results: TLR4-deficient mice had lesser infarct volumes when compared with WT mice. In addition, TLR4 selectively attenuated significant lesion volume expansion, further. TLR4 demonstrated persistent blood-brain barrier (BBB) permeability suppression at all the considered time points. Treatment regimes with peptide also resulted in remote cedema formation at the contralateral striatum and ipsilateral cortex.

Conclusions: Neuroprotection demonstrated by MTT and PEH and EGF might be mediated by a mechanism of neural repair. In this context MMP9 plays a key role and its modulation may be important to improve neurorepair.
Clinical phenotyping and family screening of patients suspected for Fabry disease identified in a large Fabry screening program in stroke in the young. L. van den Berghe1, T.F. Broeckx2, C. Troost3, C. De Graeve4, F. Eykens5, A. Heyse6, M. Van Bremmelen7, D. Hugger8, D. Demeulder9, S. Sandkuijl10, B. Sadot11, D. Nuytten12, D. Hemelsoet13, C. Sindic14, B. Sadzot15, D. Nuytten8, S. Dethy16, G.J.E. Rinkel1, Y. M. Ruigrok1, F.N.G. van ‘t Hof1, R. Kleinloog1, M. Gunel2, G.J.E. Rinkel1, M. Y. Ruigrok1

Background and Purpose: The Belgian Fabry Study suggested that Fabry disease may play a role in up to 1% of young patients with stroke, unexplained white matter lesions or vertebrobasilar dolichoectasia. We report on detailed phenotyping in subjects identified with a-galactosidase A (a-GA) enzyme deficiency or GLA mutations in the BeFaS (n=10) and on the results of family screening in this population.

Methods: Biochemical and/or clinical evaluation of all subjects (n=28) was performed. Biochemical evaluation comprised measurement of plasma/leukocyte a-Gal A enzyme activity, GLA in plasma and urine, lyso-GA in plasma.

Clinical phenotyping consisted of neurological, cardiac, renal, ophthalmological, dermatological and hearing evaluation.

Results: Genetic family screening revealed 18 additional GLA mutation carriers. Our total study population therefore consisted of 10 subjects with a p.A143T mutation, 7 subjects with a p.S126G mutation, 9 subjects with a p.D313Y mutation, 3 subjects with a p.S315X mutation and 1 subject with a p.S126G mutation. The odds of having a family history of stroke, SAH or albuminuria were significantly increased in subjects with GLA mutations.

Conclusions: Levels of VWF:Ag are positively associated with calcifications and stenosis degree in the craniocervical arteries of patients with ischemic stroke or TIA. Furthermore, levels of VWF:Ag are highest in patients with a large artery atherosclerosis etiology of ischemic stroke or TIA had significantly increased levels. Levels of VWF:Ag are also positively associated with the degree of carotid stenosis in patients with ischemic stroke or TIA. The association between VWF:Ag and stroke severity may be due to lack of power and incomplete reporting of a positive family history of SAH, which can be due to lack of power and incomplete reporting of a positive family history of SAH.

Background: Low ankle-brachial index (ABI), indicative of peripheral arterial disease, is a stroke risk factor. No prior study has investigated the degree of ABI decrease in relation to cerebral arterial disease and prognosis following stroke. We studied associations of ABI severity with extracranial carotid disease (ECD), intracranial large arterial disease (ICLAD), and subsequent vascular events following ischemic stroke.

Methods: We recruited consecutive ischemic stroke patients from 2003 to 2004 admitted at the Singapore General Hospital. Baseline assessment of extracranial and intracranial arterial baseline ABI measurements and 1-hour telephone follow-up after were performed masked to another.

Results: Among the 1,311 patients, 1,299 (99%) had follow-up data. Of these, 73% had ABI>0.8 (normal), 13% had ABI=0.8 and 13% had ABI<0.8. Compared to patients with normal ABI, those with
Etiology of stroke and risk factors B
17:30 - 17:40
Effects of visit-to-visit blood pressure variability on macrovascular and microvascular events in patients with type 2 diabetes: the ADVANCE trial

Background: Recent evidence indicates visit-to-visit variability of systolic blood pressure (SBP) is a powerful predictor of cardiovascular (CV) events. We investigated the association of SBP variability with macrovascular and microvascular events in patients with type 2 diabetes.

Methods: The ADVANCE trial was a factorial randomised controlled trial of blood pressure lowering and intensive blood glucose control in patients with type 2 diabetes. The present analysis included 8,811 patients who had not experienced macrovascular events, microvascular events or death during the first 2 years or prior to entry. SBP variability was defined using standard deviation (SD) and variation independent of mean (VIM) during 6 assessments (mean ± 3 months). Outcomes were major macrovascular (myocardial infarction and CV death) and microvascular (new or worsening nephropathy and retinopathy) events.

Results: During follow-up (median 2.4 years), major macrovascular and microvascular events were observed in 407 and 476 patients, respectively. The associated risks rose progressively with higher SD and VIM of SBP, after adjustment for other CV risk factors, including mean SBP during 6 assessments, and study treatments. Multivariable-adjusted hazard ratios (95% confidence intervals [CI]) of the highest 10% group defined by SD were 1.53 (0.98-2.38) for major macrovascular events and 1.73 (1.12-2.65) for major microvascular events compared to the lowest 10% group. Likewise, hazard ratios (95% CI) of the highest 10% group defined by VIM were 1.73 (1.12-2.64) for macrovascular events and 1.36 (0.98-2.06) for microvascular events. SBP variability was significantly associated with nonfatal myocardial infarction and CV death, but not with nonfatal stroke.

Conclusion: Visit-to-visit variability of SBP predicted the risks of major macrovascular and microvascular events in patients with type 2 diabetes.

Etiology of stroke and risk factors B
17:40 - 17:50
Do risk factors for lacunar ischemic stroke vary with the location or appearance of the lacunar infarct? A. Del Bene1, S.D.J. Makin2, F.N. Doubal2, J.M. Wardlaw2

Background: Lacunar ischemic stroke is due to an abnormality in a perforating artery. Possible causes include lipohyalinosis, atheromatosis or embolism, with some suggestion that the likely arteriolar pathology is associated with particular shape, size or location of lacunar lesion. We determined if the risk factor profiles varied with lesion size, shape or location.

Methods: All patients with clinical and DWI-positive lacunar infarction were selected from two prospective studies of patients with minor stroke. All had clinical examination, carotid ultrasound and diagnostic MR. All scans were coded by a Clinical epigist with a structured proforma blind to all details. Lacunar lesions were classified by maximum diameter (mm), shape (oval or tubular), and location (basal ganglia; centrum semiovale; brainstem). We analysed vascular risk factors individually and grouped into “potential ipsilateral embolic source” and “large artery atheroma burden”, with univariate and multivariate methods.

Results and Conclusions: Traditional risk factors were more common in patients when compared with healthy controls. Antigens for FXII, FXI and prekallikrein related poorly with the levels of the inhibited complex of the activated form of the proteins. If anything, high antigen levels of FXII increased the risk for MI modestly (OR 1.6, 95% CI 0.9-2.7) but not for IS (OR 1.1, 0.6-2.1). PK was not associated with an increased risk (MI 1.3, 0.6-2.1; IS 0.7, 0.4-1.4). High FXI increased the risk of both MI (1.8, 1.7-2.9) and IS (3.1, 1.9-3.5). The previously published 2-4 fold increase in IS risk conferred by high FXI antigen levels is likely due to other factors, as high FXI antigen levels are also associated with autonomic dysfunction.

Conclusion: High FXI antigen is a risk factor for both MI and IS, with the most pronounced risk for IS. The lack of a strong association between antigen level and activated protein level, the low risk for IS conferred by high PK and antigen levels, as well as a lack of attenuation after adjustment indicate that our previous result could mainly be driven by a higher activation level of the intrinsic coagulation proteins, instead of the protein itself.

Patient
Age (years)
Sex
Race
Place of dissection
Presenting symptoms
Imaging
Trauma
1 63 M VA(left) hemiparesis, headache US, CT, CTA
2 78 M ACA(right) hemiparesis, hemiparesis CTA, CTA
3 50 F CCA(right) diplopia, vertigo CTA, CTA
4 66 M VA(left) hemiparesis CTA, CTA
5 49 F ACA(right) sharp pain in neck US, US, CTA
6 74 M ACA(right) vertigo, dysarthria, hemiparesis CTA, CTA, MRI, MRA
7 51 M VA(left) hemiparesis, sensory CTA, MRA, CTA
8 51 M ACA(right) hemiparesis, hemiparesis CTA, CTA
9 69 M ACA(right) hemiparesis, vertigo CTA
10 53 M VA(left) hemiparesis CTA, CTA

Scientific Programme
Background: Information on cerebral morphologic findings in young patients with stroke is limited and may give pathophysiological hints. Methods: MRI scans of young (18-55 years) first ischemic stroke patients enrolled into a prospective observational study were retrospectively analyzed. Age was categorized according to the WHO: 18 to 24, 25 to 34, 35 to 44, and 45 to 55 years. Findings: There were 2278 patients with IS and 724 patients with TIA. In both groups the proportions of patients with acute ischemic abnormalities were similar across all age categories (IS: 84%; TIA: 14%). There was a high prevalence of old infarcts (24.5%) which remained high (18.8%) even when excluding patients with an earlier symptomatic CVE. The prevalence of old infarcts in those aged ≤24 to those aged >45 yrs). The relative frequency of acute infarcts in the posterior circulation decreased continuously with advancing age (particularly in males). In the highest age decade there was a rather unexpected high rate of covert old infarcts in young adults with a first ischemic CVE and a preference for posterior circulation ischemia in the very young. Findings associated with small-vessel related stroke became apparent in patients aged ≥45 years.

Conclusion: The distribution and the severity of CVLs are different in brains with CAT and with CAA, allowing to distinguish both conditions in patients with mixed dementia.

Results: In the brains with CAT there was a prevalence of lacunar infarcts (P = 0.05), while lobar haematomas (P = 0.001), cortical micro-infarcts (P < 0.001), micro-bleeds (P <0.001) and focal subarachnoid haemorrhages (P = 0.001) predominated in those with CAA. Mini-bleeds, defined as small perivascular bleeds only detected on microscopic examination, were overall not more frequent in the brains with CAA, but they prevailed in the cerebral cortex (P = 0.001). The relative frequency of acute infarcts in the posterior circulation decreased continuously with advancing age (particularly in males). In the highest age decade there was a rather unexpected high rate of covert old infarcts in young adults with a first ischemic CVE and a preference for posterior circulation ischemia in the very young. Findings associated with small-vessel related stroke became apparent in patients aged ≥45 years.

Material and Methods: Fifty brains of patients with mixed dementia were examined. In addition to the gross examination of the brains, all types of histological detected CVLs were quantified on a coronal section of a cerebral hemisphere. The number of CVLs in a defined area of each hemisphere was counted. Results were expressed as CVLs per 10 cm2. The prevalence of CVLs was compared using the Fisher exact test and the Wilcoxon rank sum test.

Background: Cerebrovascular lesions (CVLs) are frequently observed in patients with Alzheimer dementia. They can be due to cerebral arteriosclerosis (CAT) or due to cerebral amyloid angiopathy (CAA). The present study investigates whether one can distinguish differences in prevalence of CVLs due to CAT and due to CAA in post-mortem brains. Patients and Methods: Fifty brains of patients with mixed dementia were examined. In addition to the gross examination of the brains, all types of histological detected CVLs were quantified on a coronal section of a cerebral hemisphere. The number of CVLs in a defined area of each hemisphere was counted. Results were expressed as CVLs per 10 cm2. The prevalence of CVLs was compared using the Fisher exact test and the Wilcoxon rank sum test.

Quantification of cerebrovascular lesions due to arteriosclerosis and due to amyloid angiopathy in post-mortem brains of demented patients.

Results: In the brains with CAT there was a prevalence of lacunar infarcts (P = 0.05), while lobar haematomas (P = 0.001), cortical micro-infarcts (P < 0.001), micro-bleeds (P <0.001) and focal subarachnoid haemorrhages (P = 0.001) predominated in those with CAA. Mini-bleeds, defined as small perivascular bleeds only detected on microscopic examination, were overall not more frequent in the brains with CAA, but they prevailed in the cerebral cortex (P = 0.001). The relative frequency of acute infarcts in the posterior circulation decreased continuously with advancing age (particularly in males). In the highest age decade there was a rather unexpected high rate of covert old infarcts in young adults with a first ischemic CVE and a preference for posterior circulation ischemia in the very young. Findings associated with small-vessel related stroke became apparent in patients aged ≥45 years.

Material and Methods: Fifty brains of patients with mixed dementia were examined. In addition to the gross examination of the brains, all types of histological detected CVLs were quantified on a coronal section of a cerebral hemisphere. The number of CVLs in a defined area of each hemisphere was counted. Results were expressed as CVLs per 10 cm2. The prevalence of CVLs was compared using the Fisher exact test and the Wilcoxon rank sum test.

Quantification of cerebrovascular lesions due to arteriosclerosis and due to amyloid angiopathy in post-mortem brains of demented patients.

The distribution and the severity of CVLs are different in brains with CAT and with CAA, allowing to distinguish both conditions in patients with mixed dementia.
6 Brain imaging B
17:28 - 17:30

DWI Reversal is associated with Small Infarct Volume and Early Reperfusion in Patients with TIA and Minor Stroke
N. Asdaghi1, J.I. Coulter2, T.S. Stewart2
1
2

17:40 - 17:50

Clinical utility of subacute Arterial Spin Labelling in stroke
M. Griebl, M. Kabah, P. Eisler, A. Gaas, M.G. Hennerici, K. Stabs
Department of Neurology, Universitätmedizin Mannheim, University of Heidelberg, Mannheim, GERMANY

Introduction: MRI has been characterized to acute stroke lesions and guide therapy in patients with large vessel occlusions. Similar data in lacunar stroke is scarce. Methods: From our prospectively collected Mannheim stroke database we analyzed the clinical course (NIHSS, mRS, clinical deterioration) and MRI findings (lesion size and growth on DWI, course of ADC values, hemorrhagic rhufation on T2* and PWI) in acute lacunar stroke patients treated with rtPA within 4.5 hours after onset who received pre- and post-treatment MRI.

Results: Between 2004 and 2011, 37 (10.7%) of all thrombolysed patients were classified as lacunar according to lesion size and location as well as presumed etiology. Of these, 12 patients with supratentorial lesions received pre- and post-treatment MRI (mean, mean 70 years). In 5 cases, lesions were located in the internal capsule (4), the thalamus (4), and the centrum semiovale (4). Mean pretreatment NIHSS score was 6 (range 3-15); mean lesion volume on DWI was 0.84 cm³. NIHSS at discharge was lower in 9, higher in 2 and unchanged in 1 patient (median: improvement of 4 pt). DWI lesion volume on follow-up showed a reduction >50% to 90% in 8 patients, an increase 50% to 110% in 8 (Patients B) and no change in 8 cases. Two patients suffered a clinical deterioration after day 2; this was correlated with an increase in lesion volume. Lesion volume ratio showed a positive correlation with the clinical course measured by the NIHSS (R=0.47, p=0.001), however no significant correlation with age, time of therapy or chronic lesion load. There were no rtPA related complications in this collective; hemorrhagic transformation on T2* images was not detected in any case.

Discussion: In our collective, patients with lacunar stroke showed a benefit after thrombolysis without complications with partial DWI lesion reversal in a subset of these patients. Possible explanations might be an effect of rtPA on the microcirculation in the perforators.

7 Brain imaging B
17:58 - 18:00

Determinants of Recovery from Severe Posterior Reversible Encephalopathy Syndrome: A Multicentre Study

Background: Patients with transient or minor ischemic symptoms (TIA/MIS) are at risk for early deterioration. We hypothesized that baseline perfusion/PWI-diffusion/DWI mismatch predicts clinical deterioration and infarct growth in this population.

Methods: TIA/MIS/NHS Stroke Scale ≤ 3 patients were prospectively enrolled and imaged within 24h of symptom onset as part of 2 sequential cohorts. Baseline DWI, PWI (max+4 delay) - DWI) and follow-up FLAIR infarct volumes (day 30 (derivation), day 90 (validation) cohorts) were measured. Primary outcome was infarct growth on FLAIR imaging and secondary outcome was clinical progression. Results: 137 patients were included in the derivation and 281 in the validation cohorts. The rates of baseline DWI54% vs 56%, p=0.67) and PWI lesions42% vs 34%, p=0.16) were similar. Primary and secondary outcomes occurred in 18.5% and 9.5% (derivation) and 5.5% and 4.4% (validation) respectively. In the derivation cohort, baseline mismatch volumes adjusting for age, sex and time from onset to MRI significantly predicted radiographic progression (OR=1.06 [1.03-1.09], p=0.001). The optimal threshold for maximizing sensitivity(Sen) and specificity(Spec) in predicting infarct growth occurred at a mismatch volume of 10ml; which predicted infarct expansion with 82%Sen and 91%Spec (Area under the curve(AUC)= 0.89 [0.88-0.90]). In the validation cohort, this threshold highly predicted infarct growth(p=0.011). Linear regression showed that for every 10ml of mismatch, there would be 2.5 ml infarct growth on day 30 (p=0.001) and 1 ml of growth on day 90 (FLAIR; p=0.001). Baseline mismatch showed a high discriminative value in predicting clinical deterioration in the derivation AUC=0.81 [0.76-0.86] and moderate value in the validation cohort AUC=0.66 [0.46, 0.85]. Conclusion: In a population of TIA/mimor stroke patients, early MRI perfusion-diffusion mismatch predicts infarct growth and clinical deterioration. These findings suggest that there may be a group of patients with minor symptoms in whom reperfusion strategies is beneficial.

8 Brain imaging B
17:48 - 17:50

Use of DWI-only MR protocol for screening stroke mimics

Results: Between 2004 and 2011, 137 (10.1%) of all thrombolysed patients were classified as lacunar according to lesion size and location as well as presumed etiology. Of these, 12 patients with supratentorial lesions received pre- and post-treatment MRI (mean, mean 70 years). In 5 cases, lesions were located in the internal capsule (4), the thalamus (4), and the centrum semiovale (4). Mean pretreatment NIHSS score was 6 (range 3-15); mean lesion volume on DWI was 0.84 cm³. NIHSS at discharge was lower in 9, higher in 2 and unchanged in 1 patient (median: improvement of 4 pt). DWI lesion volume on follow-up showed a reduction >50% to 90% in 8 patients, an increase 50% to 110% in 8 (Patients B) and no change in 8 cases. Two patients suffered a clinical deterioration after day 2; this was correlated with an increase in lesion volume. Lesion volume ratio showed a positive correlation with the clinical course measured by the NIHSS (R=0.47, p=0.001), however no significant correlation with age, time of therapy or chronic lesion load. There were no rtPA related complications in this collective; hemorrhagic transformation on T2* images was not detected in any case.

Discussion: In our collective, patients with lacunar stroke showed a benefit after thrombolysis without complications with partial DWI lesion reversal in a subset of these patients. Possible explanations might be an effect of rtPA on the microcirculation in the perforators.

9 Brain imaging B
17:58 - 18:00

Clinical utility of subacute Arterial Spin Labelling in stroke
A. Briend, P. Stancel1, C. Leví, M. Parsons2

1

University of Melbourne, Newcastle, AUSTRALIA

University of Newcastle, Newcastle, AUSTRALIA

Introduction: Arterial Spin Labelling (ASL) is an MR perfusion technique that does not require contrast injection. The aim of this study was to clinically validate and investigate the ASL technique. Methods: Eighty patients with an acute hemispheric ischemic stroke were imaged within 6 hours of symptom onset with perfusion CT (PCT), and again at 24 hours with MRI including ASL, bolus-tracking dynamic susceptibility perfusion-weighted imaging (PWI), and diffusion-weighted imaging (DWI). The ASL perfusion lesion was compared to the CTP and PWI maps of cerebral blood volume (CBV), flow (CBF), mean transit time (MTT) and Tmax using receiver-oper-
EROTING curve area under the curve (AUC) analysis. Results: On ASL at 24 hours, 35 of 80 patients showed hyperperfusion in the originally ischemic region, and 47 showed persistent hyperperfusion (two patients presented with both hyper and hypoperfusion). Compared to patients with persistent hyperperfusion on ASL, patients with hyperperfusion had greater salvage of acute CTP mismatch tissue from progression to infarction on 24 hour DWI. ASL hyperperfusion was also associated with improved early clinical improvement: mean reduction in acute to 24h National Institutes of Health Stroke Scale (NIHSS) = 9, vs 3 for ASL hypoperfusion group (p = 0.05), as well as 90 day modified Rankin Score (mean 2, vs 4 for hyperperfusion group, p<0.01). The ASL perfusion lesion most closely correlated with the PWI Tmax map (AUC=0.85), rather than CBF (AUC=0.66) or MTT (AUC=0.73). Discussion: ASL at 24 hours post stroke has significant clinical utility, with hyperperfusion of the initial ischemic area, identifying patients with better tissue and clinical outcomes.
Appropriate patient selection for endovascular approach to acute ischaemic stroke procedures
Chair: O. Jansen, Germany

Imaging parameters to patient selection and infarct volume reduction considerations in AIS
J. Fiehler, Germany

Clot length as assessed by CT and candidates for mechanical thrombectomy
O. Jansen, Germany

TREVO studies and/or wake up stroke
R. Nogueira, USA

Panel discussion and Q & A

Sponsored and organised by Stryker Neurovascular
Thursday 24 May 2012 - Programme Overview

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<td>Acute cerebrovascular events (ACE): TIA and minor strokes</td>
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*Thursday 24 May 2012 - Programme Overview*
Scientific Programme

8:30 - 10:00 Mini Symposium 3

Combination antithrombotic therapy for stroke prevention: indications and concerns
A. Algra, The Netherlands and M. Fisher, USA

Combinations of antplatelet agents - efficacy and side-effects
P. Bath, UK

Variability of antplatelet agents: is it clinically relevant?
S. Tabasoune, France

Warfarin and antplatelet therapy: evidence for benefit and harm?
M. Fisher, USA

Antithrombotic therapy for secondary stroke prevention in ischemic stroke and SAH: switch or combine?
A. Algra, The Netherlands

8:30 - 10:00 Mini Symposium 4

Breaking frontiers for delayed reperfusion therapies
Chairs: A. Davalos, Spain and C. Molina, Spain

Intravenous thrombolysis trials (ECASS4 and EXTEND)
W. Hacke, Germany

Wake-up stroke trial
G. Thomalla, Germany

New thrombolytic agents beyond the time window
G.A. Ford, UK

Interventional management of stroke (IMS-3)
J. Broderick, USA

Thrombectomy device trials
A. Davalos, Spain

8:30 - 10:00 Oral Session. Stroke prognosis A

Chairs: A. Grau, Germany and D. McCabe, Ireland

1 Stroke prognosis A
8:30 - 8:40

Functional recovery after ischemic stroke - a matter of age. Data from the Austrian Stroke Unit Registry.
M. Knoflach1, B. Matosevic1, M. Ruecker1, M. Furtner1, A. Mair1, G. Wille1, A. Zangerle1, P. Werner2, J. Ferrari3, C. Schmidauer1, L. Seyfang1, S. Krich1, J. Willen1
Department of Neurology, Innsbruck Medical University Austria, Innsbruck, AUSTRIA;1, Department of Neurology, Hospital Rankweil, Rankweil, AUSTRIA;1, Department of Neurology, Hospital Barmherzige Brüder, Vienna, AUSTRIA;1, Danish University Kernen, Gesundheit Österreich GmbH, BIIQG, Vienna, AUSTRIA1

Objective: To analyse the association between patient age and good functional outcome after ischemic stroke with special focus on the young that were numerically underrepresented in previous evaluations. Methods: Of 44163 ischemic stroke patients prospectively enrolled in the Austrian Stroke Unit Registry, 6084 (14.1%) were ≤55 years old. Functional outcome was available in a representative subsample of 14326 patients free of pre-stroke disability, ≥2223 were 55 years or younger. Herein we analyzed the effects of age on good functional outcome 3 months after stroke (modified Rankin Scale=2). Results: Good outcome was achieved in 88.2% (unadjusted probability) of young stroke patients (55 years). In multivariable analysis, age emerged as a significant predictor of outcome independent of stroke severity, etiology, performance of thrombolysis, sex, risk factors and stroke complications. When using the age stratum 56-65 as a reference, odds ratios [95%CI] of good outcome were 3.41[9.4-6.4] and 1.5[2.1-2.9] for patients aged 18-35 and 36-45 and 46-55 and 0.70[0.60-0.81], 0.32[0.28-0.37] and 0.18[0.14-0.22) for those 66-75, 76-85 and ≥85 years old (p<0.001). In absolute terms, the regression-adjusted probability of good outcome was highest in the age group 18-35 and gradually declined by 3.1%-4.2% per decade until age 75 with a steep drop thereafter. Findings equally applied to sexes and patients with and without intravenous thrombolysis or diabetes. Conclusions: Age emerged as a highly significant inverse predictor of good functional outcome after ischemic stroke independent of stroke severity, characteristics and complications with the age-outcome association exhibiting a non-linear scale and extending to young stroke patients.

2 Stroke prognosis A
8:40 - 9:00

Age-specific risk and severity of bleeding on aspirin-based secondary prevention: a population-based study
D.O. Giraghy, Z. Mohar, P.M. Rothwell
Stroke Prevention Research Unit, Nuffield Department of Clinical Neurosciences, University of Oxford, Oxford, UNITED KINGDOM

INTRODUCTION: Use of aspirin in secondary prevention after TIA, ischemic stroke, and coronary syndromes (ACS), is based on trials done over 30 years ago, mainly in patients aged <70 years. Most patients with incident ischemic events are now aged >70 years. Risks of gastrointestinal (GI) and intracranial haemorrhage (ICH) on aspirin increase with age, but there are no reliable population-based data on absolute risks, or on whether severity of bleeds also increases with age. METHODS: We determined rates and outcome (mortality and disability) of all bleeding events that presented to medical attention during follow-up in all patients on aspirin-based ischaemic event treatment after TIA, stroke or ACS in the Oxford Vascular Study from 2002-2009. RESULTS: Of 2043 patients on antplatelet, (1946/2043, 95% aspirin-based) treatment (1257 stroke/7186 ACS), 741/1663) were ≥70 years and 1302 (84%) ≥70 years. 249 (12.2%) first bleeding events required medical attention during follow-up, with annual rates of major bleeding (CURE trial definition) of 1.06% (95%CI 0.87, 1.25) at age ≥70 and 3.8% (1.14, 6.42) at age ≥75. Only one bleed was fatal in patients >70 years old (no extracranial bleed), whereas there were 8 fatal bleeds (3 ICH and 5 extracranial) in patients aged ≥70. Disabling or fatal ICH was also more common at age ≥70 (33 vs 22) and new disability due to extracranial haemorrhage was substantially more frequent in the older age group (39 vs 0 events, p=0.001). The annual rate of death or new disability due to haemorrhage was 0.12% (0.30-0.66) at age ≥70 years versus 1.82% (1.36-2.38) at age ≥70 years (p<0.001). CONCLUSION: Risk of bleeding on aspirin-based antplatelet treatment increases steeply with age and bleed-related death and disability are common at age ≥70. Randomised trials may be justified to compare different antplatelet regimens and the use of upper-GI protection in elderly patients.

3 Stroke prognosis A
8:50 - 9:00

Outcomes of basilical artery occlusion in patients aged 75 years or older in the Basilar Artery International Cooperation Study
M.L. Vingerhoets1, A. Compter1, D. Tanne2, S.T. Engelter3, H. Audebert4, M.D.I. Vergouwen1, A. Algra1, L.J. Kappelle1, W.J. Schonewille7
BASIC Study Group
University Medical Center Utrecht, Utrecht, THE NETHERLANDS1, Chaim Sheba Medical Center, Tel-Hashomer, ISRAEL1, University Hospital Basel, Basel, SWITZERLAND2, Charité University Medicine Berlin, Berlin, GERMANY1, University Hospitals Leuven, Leuven, BELGIUM1, University of Rio de Janeiro, Rio de Janeiro, BRAZIL1, St. Antonius Hospital, Nieuwegein, THE NETHERLANDS3

Background. Patients with an acute basilar artery occlusion (BAO) have a high risk of long-lasting disability and death. Only limited data are available on functional outcome in elderly patients with BAO. Using data from the Basilar Artery International Cooperation Study (BASIC), we aimed to determine outcomes in patients ≥75 years. Methods. Primary outcome measure was poor functional outcome (modified Rankin scale score 4-6). Secondary outcomes were death, insufficient vessel recanalization (defined as thrombolysis in myocardial infarction [TIMI] score 0-1) and symptomatic intracranial hemorrhage (SICH). Patients were divided into four age-groups, based on quartiles: 18-54, 55-64, 65-74, and ≥75 years. Outcomes of BAO patients were compared between patients ≥75 years and patients aged 18-54 years. Risk ratios (RR) with corresponding 95% confidence intervals (CI) were calculated. Results. We included 619 patients (18-54 years: n=153 [25%]; 55-64 years: n=133 [21%]; 65-74 years: n=171 [28%]; and ≥75 years: n=162 [26%]). Compared with patients aged 18-54 years, patients ≥75 years were at increased risk of poor functional outcome (aRR 1.33 [1.14-1.55]) and death (aRR 2.47 [1.75-3.51]). Nevertheless, 35/162 (22%; 95% CI 18-27) patients aged ≥75 years had good functional outcome. No significant differences between age groups were observed for recanalization rate and incidence of SICH. Conclusions. Although patients ≥75 years with BAO have an increased risk of poor outcome compared with younger patients, a substantial group of patients ≥75 years survives with a good functional outcome.

4 Stroke prognosis A
9:00 - 9:10

MRI-Defined Acute Multiple Brain Infarcts in Young Adults: Clues for Etiologic Diagnosis and Prognostic Impact
S. Manitoge, J. Putaala, E. Haapanen, D. Stibman, M. Kaste, T. Taskinen
Department of Neurology, Helsinki University Central Hospital, Helsinki, FINLAND

Background and Purpose: Stroke etiology differs with age and data regarding the etiology of acute multiple brain infarcts (AMBI) in and their impact on clinical outcome in young patients are scarce.

8:30 - 10:00 Oral Session. Stroke prognosis A
The incidence and risk of mortality and recurrent vascular events in young adults. A very long-term follow-up study.


Donders Institute for Brain, Cognition and Behaviour, Centre for Neuroscience, Department of Neurology, Radboud University Nijmegen Medical Centre, Nijmegen, THE NETHERLANDS, Medisch Specturm Twente, Department of Neurology, Enschede, THE NETHERLANDS, Radboud University Nijmegen Medical Centre, Department of Cardiology, Nijmegen, THE NETHERLANDS

Background: Data on long-term survival of young patients with an ischaemic stroke (IS), intracerebral haemorrhage (ICH) or transient ischaemic attack (TIA) are limited.

Long-term prognosis is particularly important in young patients, which are in the period of life that people make decisive steps for their future, like forming a family and making career moves.

Objective: To investigate the incidence and risk of mortality and recurrent vascular events in young stroke.

Methods: We performed a prospective cohort study among 1055 consecutive patients with a TIA, IS or ICH aged 18-50 years, admitted to our centre between 1-1-1980 till 1-11-2010. Follow-up data were available for 765 patients.

Outcome measures were long-term mortality (≥30 days post-stroke), and the composite event of death from all vascular causes, non-fatal stroke, non-fatal myocardial infarction and cardiovascular procedures, whichever occurred first. Cumulative risks were estimated with Kaplan-Meier analysis, whichever occurred first. Cumulative risks were estimated with Kaplan-Meier analysis.

Results: Among all patients (mean age, 40.5 ± 7.8 years; 47.7% males), 184 (24.1%) died. After a mean follow-up of 9.6 yrs (range 0-31 yrs), cumulative risk of long-term mortality in patients with TIA, IS and ICH was 34.7, 50.1% and 59.7%, respectively (log rank p<0.05, fig.1A). Deceased patients more often had a history of diabetes (12.9% versus 3.8%; p<0.001) or hypertension (32.1% versus 19.8%; p<0.005) than survivors. 24.1% of all patients suffered from an incident vascular event. Cumulative risk of incident vascular event did not significantly differ between TIA, IS and ICH (47.7, 49.7% and 30.1%; log rank p = 0.293, fig.1B). Patients with an incident vascular event were more likely to be male (54% versus 45.3%; p=0.05) and to have a history of diabetes (8.6% versus 4.6%; p=0.05).

Conclusion: Compared with the elderly, young stroke patients have a distinct stroke etiology underlying AMBI, being an independent indicator of poor outcome and death but not for recurrent ischemic stroke.

5 Stroke prognosis A

9:10 - 9:20

The incidence and risk of mortality and recurrent vascular events in young adults. A very long-term follow-up study.

Methods: We included 609 young patients (15-49 years) in the study with a first-ever ischemic stroke treated at our department imaged with MRI, diffusion-weighted imaging (DWI) was performed for half of the patients (n=309, 50.7%). The stroke subtype was classified according to the TOAST criteria.

Results: 205 patients (33.7%) (mean age 39.7±6.2) had AMBI on MRI: 154 (25.3%) patients had lesions located in a single and 51 (8.3%) in multiple territories. DWI revealed more AMBI than conventional MRI (35% vs. 42%, P<0.05), however the AMBI area were equally distributed multi-territorially in MRI and DWI (8% vs. 8.7%, P=0.74).

Patients with AMBI had more often an unfavorable outcome (modified Rankin Scale ≥3) and they were more likely to have a high-risk source of cardioembolism (3.0% vs. 13.2%; P<0.001) or vertebral artery dissection (8.7% vs. 16.1%; P<0.05), but less frequently small-vessel disease (13.9 vs. 7.8%; P<0.05). Adjusted for age, gender, baseline stroke severity, and stroke subtype AMBI remained independently associated with an unfavorable 3-month outcome. In multivariate Cox proportional analysis, AMBI had an independent influence on the risk for death, but not on recurrent ischemic stroke in long-term follow-up.

Conclusion: Compared with the elderly, young stroke patients have a distinct stroke etiology underlying AMBI, being an independent indicator of poor outcome and death but not for recurrent ischemic stroke.

6 Stroke prognosis A

9:20 - 9:30

Leukocyte count in young adults with first-ever ischemic stroke: Associated factors and impact on prognosis.

T.J. Heikinheimo, J. Puitala, E. Haapaniemi, M. Kaste, T. Taltsamik

Helsinki University Central Hospital, Department of Neurology, Helsinki, FINLAND

Background: Limited data exist on the associated factors and correlation of leukocyte count to outcome in young adults with first-ever ischemic stroke.

Methods: In our database of 1008 consecutive patients aged 15 to 49, we included those with leukocyte count measured within the first two days from stroke onset. Out-come were 3-month disability or death (modified Rankin Scale 2-6) and events during long-term follow-up ( recurrent ischemic stroke, composite of vascular events, and death from any cause). Linear regression was used to explore baseline variables associated with leukocyte count.

Results: In our study cohort of 797 patients (61.7% males; mean age 41.4 ± years; 75% of blood samples drawn on day 0) mean leukocyte count was 8.8±3.1 X10 9 cells/L. Higher leukocyte levels were associated with dyslipidemia, smoking, perinatal arterial disease, stroke severity, and lesion size. After adjustment for age, gen-der, relevant risk factors including preceding infection and malignancy, delay to to-koctkey measurement, baseline NIH Stroke Scale score, and etiologic subtype, both continuous leukocyte count (p = 0.13 per unit increase; 0.96–2.21) and the highest (compared to lowest) quartile of leukocyte count (odds ratio 2.40; 95% confidence interval 1.45–3.97) were independently associated with unfavorable 3-month outcome. Regarding events in the long-term (follow-up 6.1±4.2 years in survivors), no association between leukocyte count and the event risks appeared.

Conclusion: Among young stroke patients high leukocyte count was a common finding. It was associated with vascular disease and is risk factors as well as severity of stroke, but it was also independently associated with unfavorable 3-month outcome in these patients.

7 Stroke prognosis A

9:30 - 9:40

The incidence and risk of post-stroke seizures and epilepsy in elderly patients. A very long-term follow-up study.


Radboud University Nijmegen Medical Centre, Nijmegen, THE NETHERLANDS

Background: Post-stroke seizures affect long-term prognosis and quality of life, especially in young patients with a long life expectancy. However, little is known about post-stroke seizures after young stroke. We therefore investigated the incidence and risk of post-stroke seizures and epilepsy in young adults with a transient ischemic attack (TIA), ischemic stroke (IS) or intracerebral hemorrhage (ICH).

Methods: We performed a prospective cohort study among 1055 consecutive patients with a TIA, IS or ICH aged 18-50 years admitted to the Radboud University Medical Centre Nijmegen between 1-1-1980 till 1-11-2010. 84 patients were lost to follow up and 156 refused to participate, resulting in a study population of 765 patients with a mean follow-up of 9.1 years (range 0.3-31.3). Post-stroke seizures and epilepsy was assessed by standardized, structured questionnaires. Cumulative risks were calculated by Kaplan-Meier analysis and relative risks with multivariate Cox proportional hazard analysis.

Results: 95 (12.4%) patients developed post-stroke seizures and 46 (6.0%) epilepsy during over 9 years of follow-up. Patients with an initial late seizure more often had post-stroke epilepsy than patients with an early seizure (59.0% vs 29.4%; p=0.006). Cumulative risk of post-stroke seizures was 38% in patients with an ICH, 15% in IS and 5% in a TIA (Log rank ICH vs TIA and IS vs TIA p<0.001, IS vs ICH p=0.019). Cumulative risk of epilepsy was 28%, 8% and 3% respectively. Men and patients with a history of seizures had a higher risk at developing post-stroke seizures (HR 1.69; 95% CI 1.0-2.4) and 2.8 (95% CI 1.4-5.4).

Conclusion: In our study with the longest follow-up so far post-stroke seizures and epilepsy in young stroke are far more common than previously thought, especially in men and patients with an ICH. Future studies should investigate the relationship with mortality, quality of life and the effect of anti-epileptic drugs on the risk of post-stroke epilepsy.
8 Stroke prognosis A 9:40 - 9:50

The usefulness of PWI-based Time Intensity Curve to predict neurological deterioration after onset in Acute Ischemic Stroke Patients with Severe Stenosis or Occlusion Of The Internal Carotid or Middle Carotid Artery
M.N. Nukazaki, T.M. Mori, T.I. Isata, H.T. Tajiri, Y.M. Miyazaki, Y.M. Mizoangi
Department of stroke treatment, StROKE center, Shonan Kamakura General Hospital, Kamakura, JAPAN

PURPOSE: To investigate whether or not PWI-based time intensity curve (TIC) can easily predict their neurological deterioration of the acute ischemic stroke patients with severe stenosis of ICA or MCA. METHODS Included for retrospective analysis were acute stroke patients 1) who were admitted to our institution from October 2008 to September 2011 within 48hours from onset, 2) with mild neurologic symptoms of NIHSS score of 10 or less without consciousness disturbance, 3) who underwent emergency MRI study on admission, which demonstrated the ischemic lesion in the MCA territory, 4) who were treated without reperfusion therapy, and 5) who had severe stenosis (70% or more) or occlusion of the ICA or MCA in the affected side by DS. We evaluated DWI findings by DWI-ASPECTS and PWI findings by time-intensity-curve (TIC) grade (1 to 4). TICs were generated on region of interests set at symmetrical positions of the bilateral MCA territories, were classified into four grades according to the time to peak (TP) and the reduction value of the peak signal (PS). We investigated patient’s base-line features, DWI-ASPECTS, TIC grades, NIHSS on admission (adm_NIHSS), NIHSS on the 7th day (7d_NIHSS) and difference between 7d_NIHSS and adm_NIHSS (7d-adm_NIHSS). We defined neurological deterioration as 7d-adm_NIHSS of more than 0. RESULTS We analyzed 7 patients (median age=73), median adm_NIHSS was 4. Median DWI-ASPECT score was 9, 2 patients had grade of 1, 11 had grade 2, 38 had grade 3, and 20 had grade 4. Median 7d_NIHSS was 1. In 60 patients, 7d-adm_NIHSS was 0 or less. However, in 11 patients, 7d-adm_NIHSS was more than 0. Among the 11 patients, 9 patients (82%) had grade 1-2 of TIC at admission. Logistic regression analysis also demonstrated grade 1-2 of TIC was an independent significant predictor of neurological deterioration (OR,62.5; 95%CI,10.0-333.3, P<0.001). CONCLUSION In acute ischemic stroke patients with severe stenosis or occlusion of the IC or MCA, PWI-based TIC was useful in predicting neurological deterioration after admission on.

9 Stroke prognosis A 9:50 - 10:00

Depressive symptoms after young stroke. A very long-term follow up study. The FUTURE Study.
M.N. Nukazaki, T.M. Mori, T.I. Isata, H.T. Tajiri, Y.M. Miyazaki, Y.M. Mizoangi
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Depressive symptoms after young stroke occur in elderly stroke survivors, with a short-term prevalence of around 20%. However, up to 15% of all strokes occur in young adults, in whom especially long-term prognosis matters due long life expectancy. There are no studies with a long-term follow up on post-stroke depressive symptoms in young stroke patients.

Objective: To investigate the cumulative incidence of depressive symptoms after young stroke, compared with controls.

Methods: We performed a prospective cohort study among 1005 consecutive patients aged 18-50 years with a transient ischemic attack (TIA), ischemic stroke (IS) or intracerebral hemorrhage (ICH) admitted to our hospital between 1-1-1990 till 1-11-2010. 84 Patients were lost to follow up, 156 refused to participate and 184 died, resulting in a study population of 581 patients. Age and sex matched relative were controls (n=152). Depressive symptoms were defined as a score of >7 on the depression items of the Hospital Anxiety and Depression Scale (HADS). Adjustments were made for stroke severity.

Results: Mean age at the time of event was 46.0 (SD 8.8) years, 54.6% was female. Mean follow-up was 9.8 years. The overall cumulative incidence of depressive symptoms was 12% in men and 16% in women. This was highest in patients with IS (20%), compared with 7% in controls (p=0.01), followed by 11% and 7% of those with a TIA or ICH, respectively. 20% Of patients between 40 and 50 years at the time of young stroke had depressive symptoms, compared with 7% in patients with young stroke < 30 years (p=0.02). The prevalence of depressive symptoms did not differ by duration of follow up.

Conclusion: We found depressive symptoms in one out of five young stroke patients, persisting up to 30 years after stroke! Future research should investigate on pathophysiology and how this affects recovery after stroke and quality of life on the long-term.

8:30 - 10:00 Oral Session. Acute cerebrovascular events (ACE): TIA and minor strokes

Auditorium VIII

Chairs: R. Ackerman, USA and J. Kim, South Korea

1 Acute cerebrovascular events (ACE): TIA and minor strokes 8:10 - 8:40

Potential utility of Face Arm Speech Test (FAST) in public education about TIA and minor stroke
N.L.M. Paul, L. Li, P.M.Rothwell
Stroke Prevention Research Unit, Nuffield Department of Clinical Neurosciences, University of Oxford, Oxford, UNITED KINGDOM

BACKGROUND: The Face Arm Speech Test (FAST) is used in public education to help people recognise stroke symptoms. It was designed primarily to identify major stroke in order to facilitate acute treatment. However, it is uncertain how well the test identifies those with TIA and minor stroke, particularly those with a high early risk of major stroke in whom acute prevention is required.

METHODS: In a population-based study in Oxfordshire, UK (Oxford Vascular Study), we categorised consecutive patients with TIA and stroke (minor stroke=NIHSS≤5) using the FAST test in relation to delay in seeking medical attention and early recurrent stroke risks.

RESULTS: Of 2183 patients (1000 TIA, 775 minor stroke, 408 major stroke), 1432 (66%) were FAST positive. Of patients with TIA or minor stroke, 127 patients (95 TIA, 32 stroke) had a recurrent stroke within 7-days (7.2%, 95%CI 6.0-8.4) and 210 within 90-days (11.8%, 10.2-13.4). A positive FAST test did not predict early recurrent (7-day risk:7.6% vs 6.5%, p=0.6, sensitivity=62.2%, specificity=45%, 39-143.9). The test also had limited potential to improve access to care, being positive in only 130/599 (24%) of TIA patients who delayed seeking medical attention >24 hours and in only 35 (58.6%) of a further 81 TIA or stroke patients who did not seek medical attention until after a recurrent stroke. Moreover, there is at least a theoretical potential for false negative in FAST negative patients, 435/685 of whom did seek attention within 24 hours.

CONCLUSION: FAST does not identify patients with TIA or minor stroke who are at high early risk of recurrent stroke and therefore has limited potential to improve prevention after TIA and minor stroke. One unintended consequence of media campaigns based on FAST is that patients with TIA and minor stroke may be falsely reassured by a “negative” test and may delay seeking medical attention or not present at all.

2 Acute cerebrovascular events (ACE): TIA and minor strokes 8:40 - 8:50

Why do motor symptoms predict a high early risk of stroke after TIA?
N.L.M. Paul, P.M. Rothwell
Stroke Prevention Research Unit, Nuffield Department of Clinical Neurosciences, University of Oxford, Oxford, UNITED KINGDOM

BACKGROUND: The ABCD2 score predicts early risk of recurrent stroke in unselected TIA referrals, in patients with a clinical diagnosis of TIA and even those with a “positive” DWI. The age, blood pressure and diabetes elements of the score can be all plausibly related to stroke risk, but it is unclear why motor symptoms should indicate a particularly high risk.

METHODS: We studied clinical characteristics of the first 1000 TIAs and subsequent strokes in a population-based study (Oxford Vascular Study) from 2002-2010. The predictive power of ABCD2 was determined in relation to TOAST subtype and clinical symptoms. RESULTS: Among 1000 patients with TIA, the 7-day stroke risk was highest after small vessel disease (SVDD) TIAS: 27/109 (24.8%) vs 68/981 (7.6%), p<0.001. Risks in other subtypes were 12.5% (7.6-18.0) for large artery atherosclerosis (LAA), 11.4% (7.1-16.0) for cardioembolic, 3.4% (1.8-5.0) for undetermined and 1.3% (7.4-19.2) for unknown. The ABCD2 score tended to predict 7-day stroke
Perfusion Imaging Predicts Outcome in TIA and Minor Stroke. A Prospective Derivation-Validation Study

D.C. Sheehan1, N. Hannon1, M. Marnane1, A. Merwick1, E. Callaly1, D. NiCroinin1, E. Fallon1, G. Horgan1, S. Murphy2, A. Moore3, J. Moroney3, E. Dolan4
UCD/DAMC Catherine McAuley Centre, Dublin, IRELAND1
Matre University Hospital, Dublin, IRELAND, Beaumont Hospital, Dublin, IRELAND, Connolly Hospital, Dublin, IRELAND

Background: DWI shows sub-cerebral clinical ischemic injury in up to 40% of patients with TIA and minor strokes and substantially improves risk stratification after TIA. As after acute DWI is limited in many healthcare settings, insensitivily-defined alternates biomarkers available at ‘point-of-care’ may be useful to improve TIA diagnosis and prognosis. In practice, subtle motor abnormalities (SMAs) on clinical examination suggesting minor cerebrovascular tract injury are frequently detected in patients whose symptoms have completely resolved. We aimed to investigate SMAs to improve TIA diagnosis and prognosis.

Methods: Patients were enrolled in the Biomarker and Imaging Of Transient Ischaemic Attack Study (BIO-TIA). Controls were patients with transient neurological symptoms not attributed to ischaemia after specialist assessment. All patients had standardized assessment for 4 pre-specified SMAs: (1) widened inter-palpebral fissure, (2) unilateral flattened nasoalveolar fold, (3) mild forehead prominen or downward drift (4) failure to maintain digital adhesion of the outstretched hand.

Results: 173 TIA patients and 80 controls were included. SMAs were detected in 54 TIA patients (31.2%) and 11 (13.8%) controls (p=0.003). SMAs had low sensitivity (31.2%) but high specificity (86.3%) for final stroke specialist diagnosis of TIA. 164 TIA patients had acute DWI, with abnormality in 36.6%. SMAs were more frequent in patients with DWI abnormality (Odds ratio 2.3, 95% CI 1.5-3.4, p=0.0002). 54.4% of TIA patients with SMAs had 90-day stroke among the outstretched hand.

Conclusions: We found that a substantial proportion of patients with TIA and minor stroke are left disabled. Although some patients have disability as their result of their presenting event, symptom progression or recent recurrence is associated with a four-fold increase in the risk of disability.

Statin Therapy (prior or post) does not Improve Clinical and Radiographic Outcomes in Patients with TIA and Minor Stroke

A. Merwick1, G.W. Albers2, H. Ay3, S.B. Coutts4, B.L. Cucchiara5, J.L. Mas6, F. Purroy7, P.M. Rothwell8, J.L. Saver9
Vancouver Stroke Program, University of British Columbia, Vancouver, CANADA1
Calgary Stroke Program, University of Calgary, Calgary, CANADA2
CONCLUSION: The predictive power of motor symptoms in the ABCD2 score is mainly accounted for by hemi-motor lacunar TIAs, reflecting the high stroke risk in the capsular warning syndrome.

5 Acute cerebrovascular events (ACE): TIA and minor strokes

P09-19-20
Perfusion Imaging Predicts Outcome in TIA and Minor Stroke, A Prospective Derivation-Validation Study

N. Adaghe1, J.L. Coutler1, J. Modé1, A. Qazi1, M. Goyal1, A.M. Demicuč1, M.D. Hiff1, S.B Coutts1
Vancouver Stroke Program, University of British Columbia, Vancouver, CANADA1
Calgary Stroke Program, University of Calgary, Calgary, CANADA2

Statin treatment at onset of transient ischaemic attack with carotid stenosis is associated with reduced early stroke risk

A. Merwick1, G.W. Albers2, H. Ay3, S.B. Coutts4, B.L. Cucchiara5, J.L. Mas6, F. Purroy7, P.M. Rothwell8, J.L. Saver9
Vancouver Stroke Program, University of British Columbia, Vancouver, CANADA1
Calgary Stroke Program, University of Calgary, Calgary, CANADA2

Carotid stenosis (CS) predicts early risk in TIA patients, independently of acute DWI score and diffusion MRI (DWI) abnormality. Randomised trials showed statins reduce risk of recurrent stroke when initiated months after TIA or stroke. Statin use is known to lower cholesterol and reduce inflammatory markers. However, the impact of early statin use in symptomatic carotid stenosis (CS) is unclear. We aimed to determine if statin therapy at baseline modified stroke risk in symptomatic carotid stenosis. Methods: We analysed data from 2747 prospectively-defined TIA patients from 11 centres, 390 with symptomatic carotid stenosis (50% stenosis narrowing). ABCD2 items, clinical variables, abnormal DWI baseline, medicare and follow up at 7 and 90 days were recorded. Results: In patients with carotid stenosis, 7 day stroke risk was 9.0% (34/377) compared to 2.7% (61/2280) in patients without CS (p=0.0001). At 90 days risks were 18.7% (51/273) vs 5.7% (94/1652) in patients with CS (p<0.0001). 35% patients with carotid had carotid revascularisation. On univariate analysis, 90-day stroke cases, patients had only smoking (OR 3.5; 95% CI 1.7-7.2, p=0.001), abnormal acute DWI (OR 3.9; 95% CI 1.2-12.3, p=0.02), ABCD2 index (OR 2.9; 95% CI 1.5-5.6, p=0.02) and age (OR 0.91; 95% CI 0.89-0.93, p<0.001). On multivariable logistic regression, ABCD2 risk category (OR 2.4; 95% CI 1.4-4.3, p<0.001) and smoking (OR 3.1; 95% CI 1.4-6.9, p=0.005) were independently associated with 90-day stroke risk, and statins were protective (OR 0.4; 95% CI 0.16-0.95, P=0.04). Conclusion: Early statin treatment may reduce stroke in the acute phase after TIA due to CS. More studies are needed to examine potential plaque stabilization and neuro-protective roles of statins in acute cerebrovascular disease.

6 Acute cerebrovascular events (ACE): TIA and minor strokes

P09-19-20
Statin therapy (prior or post) does not improve clinical and radiographic outcomes in patients with TIA and minor stroke

N. Adaghe1, J.L. Coutler1, T. Stewart1, A. Qazi1, M. Goyal1, M.D. Hiff1, A.M. Demicuč1, S.B Coutts1
Vancouver Stroke Program, University of British Columbia, Vancouver, CANADA1
Calgary Stroke Program, University of Calgary, Calgary, CANADA2

Introduction: Clinical studies have suggested that pre-morbid and early statin therapy is associated with improved outcomes and diminished infarct growth after major stroke. We studied the association between statin therapy and early radiographic outcomes in patients with TIA/minor strokes. Methods: TIA/stroke/minorNIHSS & NIHSS<8 outcomes in patients with TIA/minor strokes (n=4885) were prospectively enrolled and imaged within 24hr of symptom onset. Patients were followed clinically and had a repeat MRI at 3months. Modified rankin score(MRS). NIHSS and infarct volumes were assessed at baseline and at 90days. We assessed whether pre-stroke statin therapy or the addition of statin therapy at 90days modified baseline infarct volume, positive baseline infarct volume, change in NIHSS score and risk of recurrent stroke. Results: 432 patients were included in this study (974/222(42.9%) were on statin therapy prior to their index ischaemic event and 693/1357 (51.2%) were initially on statin therapy). Primary outcome was a composite of death, myocardial infarction and stroke (1.8% vs 2.9%, p=0.71). Conclusion: Early statin therapy in patients with TIA or minor stroke does not reduce the risk of death, myocardial infarction and stroke. More studies are needed to examine potential plaque stabilization and neuro-protective roles of statins in acute cerebrovascular disease.

7 Acute cerebrovascular events (ACE): TIA and minor strokes

P09-19-20
Statin Therapy (prior or post) does not improve Clinical and Radiographic Outcomes in Patients with TIA and Minor Stroke

A. Merwick1, G.W. Albers2, H. Ay3, S.B. Coutts4, B.L. Cucchiara5, J.L. Mas6, F. Purroy7, P.M. Rothwell8, J.L. Saver9
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Acute cerebrovascular events (ACE): TIA and minor strokes

P09-19-20
Statin therapy (prior or post) does not improve clinical and radiographic outcomes in patients with TIA and minor stroke

A. Merwick1, G.W. Albers2, H. Ay3, S.B. Coutts4, B.L. Cucchiara5, J.L. Mas6, F. Purroy7, P.M. Rothwell8, J.L. Saver9
Vancouver Stroke Program, University of British Columbia, Vancouver, CANADA1
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Conclusions: Early statin treatment may reduce stroke in the acute phase after TIA due to CS. More studies are needed to examine potential plaque stabilization and neuro-protective roles of statins in acute cerebrovascular disease.

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Acute cerebrovascular events (ACE): TIA and minor strokes

8:30 - 10:00

A. Compter, L.J. Kappelle, A. Algra, H.B. van der Worp - Academic Medical Center, University of Amsterdam, Amsterdam, THE NETHERLANDS

Do stroke units benefit patients with haemorrhagic stroke? an updated systematic review and meta-analysis

Methods: We conducted a secondary analysis of a systematic review of stroke unit trials (34 trials; 8800 patients) to include only modern trials (published after 1990) of a discreet stroke ward where haemorrhagic (HS) and ischemic stroke (IS) patient outcomes could be compared. The primary outcomes were death and dependency at the end of scheduled follow up.

Results: We identified 13 trials (3570 patients) that tested an eligible modern stroke unit and recruited both HS and IS patients of which eight could provide data on 2657 patients (483 with HS, 2174 with IS). Overall organised stroke unit care reduced case fatality (Odds Ratio 0.67; 95% CI 0.48-0.91; P=0.01; 12.5-34% with a significantly greater (P=0.05) effect for the HS subgroup (OR 0.47; 95% CI 0.30-0.73) compared with the IS subgroup (OR 0.76; 95% CI 0.55-1.06) from the combined population (OR 0.73; 95% CI 0.34-1.59). The subgroup differences were not seen for the outcome of death or institutionalisation or when the analysis was restricted to the most methodologically robust trials.

Conclusion: Stroke unit care reduced the risk of death and dependency at least in the same or IS patients. The clinical experience of stroke unit care should be applicable to the general care of HS patients.

3 Acute stroke: emergence management, stroke units and complications A

Stroke Unit Trialists Collaboration - University of Rome, Rome, ITALY

8:40 - 9:00

M. Mazya1, J.A. Egido2, G.A. Ford3, K.R. Lees4, R.M. Mikulik5, D. Toni6, N. Wahlgren1, N. Ahmed1 - University of Rome, Rome, ITALY

The SITS SICH risk score predicts large cerebral parenchymal haemorrhages associated with severe clinical deterioration. The score could aid clinicians to identify patients at high, as well as low risk of SICH following intravenous alteplase.

Model performance was assessed using the area under the receiver operating characteristic curve (ROC). The score was internally validated in a separate cohort (n=15813) and the combined population (n=31627) using ROC analysis. The risk factors associated with SICH were entered into a logistic regression model after stratification of continuous variables. Adjusted odds ratios for the independent risk factors were converted into points summed to produce a risk score. The SITS Investigators - Department of Neurology, Karolinska University Hospital, Department of clinical neuroscience, Karolinska Institutet, Stockholm, SWEDEN; Stroke Unit, Hospital Clinico San Carlos, Universidad Complutense, Madrid, SPAIN; Stroke Research Group, Institute for Ageing and Health, Newcastle University, Newcastle, UNITED KINGDOM; Stroke Unit & Cerebrovascular Clinic, Institute of Cardiovascular & Medical Sciences, University of Glasgow, Glasgow, UNITED KINGDOM; International Clinical Research Center, Neurology Department, St. Anne’s Hospital, Brno, CZECH REPUBLIC, Department of Neurology and Psychiatry, Sapientia University of Rome., Rome, ITALY

Background: Symptomatic intracerebral haemorrhage (SICH) is a serious complication in patients with acute ischaemic stroke treated with intravenous thrombolysis. We aimed to develop a clinical score which can easily be applied to predict the risk of SICH.

Model performance was assessed using the area under the receiver operating characteristic curve (ROC). The score was internally validated in a separate cohort (n=15813) and the combined population (n=31627) using ROC analysis. The risk factors associated with SICH were entered into a logistic regression model after stratification of continuous variables. Adjusted odds ratios for the independent risk factors were converted into points summed to produce a risk score.

The SITS SICH risk score predicts large cerebral parenchymal haemorrhages associated with severe clinical deterioration. The score could aid clinicians to identify patients at high, as well as low risk of SICH following intravenous alteplase.

3 Acute cerebrovascular events (ACE): TIA and minor strokes

8:00 - 9:00

T. Karapanayiotides, Greece and V. Thijs, Belgium

9:40 - 9:50

8 Acute cerebrovascular events (ACE): TIA and minor strokes

Acute cerebrovascular events (ACE): TIA and minor strokes

8:40 - 9:00


The aim of our study was to correlate cardiembolic etiology with different serum biomarkers measured in consecutive TIA patients.

Methods: We quantified the concentrations of Interleukin-6, tumor necrosis factor, protein S-100 B, neuron specific enolase, high sensitivity C reactive protein and the N-terminal pro B type natriuretic peptide (pro-BNP) in the serum of 139 patients with TIA. Measurements were performed at different evolutionary times: within 24 hours of symptoms onset, at 7 days and at 90 days. The cause of TIA was classified according to TOAST criteria.

Conclusion: About half of the patients with a TIA or non-disabling strokes present both with focal and nonfocal symptoms. Nonfocal symptoms are associated with the presence of a VA stenosis. Funding: Dutch Heart Foundation (02B7045).
5 Acute stroke: emergency management, stroke units and complications

5.10 - 9.20

Stroke thrombolysis is efficient and safe around the clock: results from the SITS-EST-east region

J. Kautz, J. Meier, M. Bayer, M. Pfeiler, E. Würsch, J. Gassner, H. Haiden

Background: The data set of the latest Implementation of Thrombolysis in Stroke - Stroke Thrombolysis Registry - SITS-EST (eastern and central Europe) registry were used. The time of stroke onset was categorized as follows: night time 00:00-06:59, day time 07:00-16:59, evening time 17:00-23:59. Demographic data, medical history, baseline characteristics, and outcome (mRS score after 3 months, death, NIHSS after 24h, and 7 days) and safety parameters (SICH-SITS, NINDS, and ECASSII) were used for analysis. The relation between outcome and safety parameters and time of stroke onset was analysed using complete case multivariate logistic regression with deep selection.

Results: A total of 5563 patients were included into the analysis. Most of the strokes occurred during daytime (54%), followed by evening hours (28%) and night time (18%). Information about 3 months outcome (mRS score 0-1 vs > 2) was available for 5109 patients (92%) and 4282 cases (87%) were included in the multivariate analysis.

There were no significant differences between the subgroups of stroke onset time and outcome in multivariate regression analysis. The occurrence of sICH was not higher after night or evening strokes compared to day time and safety parameters (SICH-SITS, NINDS, and ECASSII) were used for analysis. The relation between outcome and safety parameters and time of stroke onset was analysed using complete case multivariate logistic regression with deep selection.

Conclusion: Our results support that stroke thrombolysis is safe around the clock and does not depend on the time of day when the treatment was initiated.

6 Acute stroke: emergency management, stroke units and complications

6.10 - 9.10

CT perfusion and CT angiography and the risk of contrast induced nephropathy in acute ischemic stroke

M.J.A. Uitse, M. Dawson, T. van Setters, J.J. Kapelle, B.K. Veltkamp, G.J. Boezaart

University Medical Center Utrecht, Utrecht, THE NETHERLANDS

Background

Contrast enhanced CT perfusion (CTP) and CT angiography (CTA) are increasingly used to determine the extent and severity of cerebral ischemia in patients with acute stroke. A point of concern is that contrast enhanced CT scanning may lead to contrast-induced nephropathy (CIN). The aim of this study was to assess the risk of CIN due to CTP/CTA in patients with acute ischemic stroke.

Methods: We included 93 patients who underwent CTP/CTA for suspected acute ischemic stroke and whose renal function was measured on admission. Admission serum creatinine levels were not known at the time of CT scanning. Patients with known renal failure or contra-indications for contrast administration were excluded. CIN was defined as: (1) a creatinine increase of > 44µmol/L or (2) a relative increase in serum creatinine by > 25% in baseline creatinine levels within 24 hours after contrast administration.

Results: We monitored follow-up creatinine levels at day 3 ~ 4 after stroke. We monitored follow-up creatinine levels at day 3 ~ 4 after stroke. We followed up creatinine levels at day 3 ~ 4 after stroke. We investigated whether patients with CIN developed clinically significant renal dysfunction for which medical consultation or treatment was required. Result:

Follow-up serum creatinine levels at day 3 ~ 4 were available in 604 (66.2%) patients. According to the definition 7 (1.2%) patients had an absolute serum creatinine increase of > 44µmol/L and 29 (4.8%) had a relative creatinine increase of > 25% in baseline creatinine levels within 24 hours after contrast administration.

Conclusion: The incidence of CIN is low in patients with suspected acute ischemic stroke undergoing diagnostic CT/CTA. Therefore, CT/CTA imaging can be performed without prior knowledge of creatinine levels in patients with suspected acute ischemic stroke without a history of renal disease.

8 Acute stroke: emergency management, stroke units and complications

8.10 - 9.10

The impact of a provincial system of stroke care delivery on stroke care outcomes


University of Toronto, Toronto, CANADA, Institute for Clinical Evaluative Sciences, Toronto, CANADA

Background: Little is known about the effectiveness of regional stroke systems in improving stroke care. The aim of this study was to assess the impact of the Ontario Stroke System, implemented in 2005 on stroke care and outcomes. Methods: We used population-based administrative databases to identify all emergency department visits and hospitalizations for acute stroke and transient ischemic attack from January 1, 2001 to December 31, 2010. Using interrupted time series analysis, we assessed the impact of the Ontario Stroke System on the proportion of patients who received care at a regional stroke centre. Secondary outcomes included length of stay, rates of discharge to long-term care facilities and thirty-day mortality after stroke. We also used detailed clinical data collected by the Registry of the Canadian Stroke Network to evaluate temporal trends in stroke care delivery. Results: We studied 242,535 patients with acute stroke or transient ischemic attack. The proportion of patients receiving care at a regional stroke centre increased from 24% in 2001 to 31% in 2010. Implementation of the Ontario Stroke System in 2005 was associated with decreased rates of institutionalization (17% to 15%), median length of stay (7 days to 6 days) and 30-day mortality for hemorrhagic (38.3% to 34.4%) and ischemic stroke (16.3% to 15.7%) (< 0.001 for all comparisons).

Conclusion: The implementation of the provincial system of stroke care was associated with improved outcomes.

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The effects of very early therapy for aphasia on recovery are equivocal. This paper examines the likely predictors of outcome in very early aphasia recovery.

Methods
Two prospective, randomized, single-blind trials were conducted in 2 Australian acute and subacute hospitals. Each study participated random participants by a random-number generator and sealed envelopes. Study 1 (N=95) investigated the effects of intervention intensity by comparing daily therapy versus usual ward care (UC) therapy for up to four weeks post-stroke in patients with moderate-severe aphasia. Study 2 (N=20) investigated the nature of therapy by comparing group versus individual therapy each day for a total of up to 20 one-hour sessions over five weeks in patients with mild-severe aphasia. The primary outcome measure was the WAB Aphasia Quotient (AQ) at the end of therapy. A secondary analysis of 12-month data examined the effects of age, baseline AQ, baseline mRS, average therapy amount, therapy intensity and number of therapy sessions on aphasia recovery. Regression models were developed using forward and backward selection.

Results:
Seventy nine patients were analyzed: 9 were lost to follow-up. The mean (SD) participant age was 69.5 years (14.0); baseline AQ score was 31.7 (27.6) and mRS was 4.0 (3.7). The mean (SD) total therapy amount was 590 minutes (486.8) for daily intervention (N= 52) and 11 minutes (38.7) for UC (N=27). Therapy intensity and average therapy amount were highly correlated (r=.857, p=.000).

Conclusion:
The amount of very early aphasia therapy could significantly affect communication outcomes at 4-5 weeks post-stroke. Ongoing studies establishing that these benefits persist beyond the first months post-stroke will enhance service delivery for people with aphasia.

2 Rehabilitation and reorganisation after stroke A
8:40 - 9:00

M. Ali1, C. Hazelton1, P. Lyden2, A. Pollock1, M. Brady1
On behalf of the VISTA Collaboration
NMA/PH Research Unit, Glasgow Caledonian University, Glasgow, UNITED KINGDOM, Cedars-Sinai Medical Center, Los Angeles, USA

Background: Transcranial direct current stimulation (tDCS), a non-invasive method of brain stimulation that has been shown to modulate cortical activity and improve motor function in the chronic stages of stroke. It is uncertain whether tDCS can influence gait function in the sub-acute stage of stroke. Aim: This double-blind, sham-controlled study, evaluated the effect of single session, bi-epileptic tDCS on gait performance, in the weeks immediately following stroke (2-8 weeks).

Methods: Ten sub-acute stroke patients were randomly allocated to receive either real (n=5) or sham (n=5) tDCS. The anodal electrode, which increases cortical excitability, was placed on the scalp over the lower limb primary motor cortex of the lesioned hemisphere. The cathodal electrode, which decreases excitability of the cortex, was placed over the non-lesioned leg motor area. Gait performance was measured using two validated clinical measures; the Timed Balance and Gait Index the Timed Up and Go test. The measures were recorded at baseline, real or sham tDCS was then administered using a randomized, double-blind approach and then gait performance measures were recorded again.

Results: We observed a statistically significant reduction in the time to complete the Timed Up and Go test in the tDCS group, compared to the sham group (p=0.016). The Timed Balance and Gait index was no different between groups (p=0.95).

Conclusion: This is the first study to examine the effects of tDCS on gait in stroke patients in the sub-acute stage. Bi-epileptic tDCS improves the walking speed of the stroke patients, despite no changes to limb biomechanics of the hemiparetic side, as compared to sham stimulation. Thus, our results suggest that tDCS could be used as a therapeutic adjunct for gait rehabilitation following stroke.
**Microscopic damage to the left hemisphere contributes in determining neglect in patients with right hemispheric stroke.**

G. Koch, C. Mastroppasqua, S. Boniti, C. Callagione, M. Bozzali
Fondazione Santa Lucia IBCCU, Rome, ITALY

AIM: We recently demonstrated an asymmetry of parietal interhemispheric connections in healthy subjects, mediated by direct transcallosal projections located in the posterior part of the corpus callosum (CC) (1), whose damage might contribute to explain the clinical manifestations of ‘neglect’. Here we aimed to investigate, using diffusion tensor imaging magnetic resonance (DT-MRI) and tract-based spatial statistics (TBSS), the contribution of microstructural white matter (WM) changes in the left hemisphere (LH) in determining the severity of hemispheric neglect in patients with a right hemispheric lesion.

METHODS: We recruited 10 patients suffering from stroke in the right hemisphere and 10 healthy matched controls. All subjects had an MRI scan at 3T including: i) conventional MRI sequences; ii) DTI and iii) T1-weighted volume. TBSS was used to assess: i) the presence and extension of changes in fractional anisotropy (FA) ii) an index of microscopic WM integrity (t) in LHS of patients compared to controls; and ii) to investigate, by correlation analysis, whether this damage might account for the presence and severity of neglect, as assessed by the Behavioural Inattention Test (BIT).

RESULTS: TBSS analysis revealed a diffuse reduction of FA in most of their LH tracts, with a predominant involvement of the CC and its projections on the parietal WM. Correlation analysis revealed significant association between BIT scores and the FA values of fifth portion of CC.

DISCUSSION: The LH widespread micro-structural damage is likely to interfere with inter-hemispheric disconnection mechanism. The association between FA values in the posterior part of the CC and BIT scores suggests a major role of this portion of the CC, supporting the role of interhemispheric right-left asymmetry mediated by transcallosal projections for the occurrence of neglect (2,3).


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**6 Rehabilitation and reorganisation after stroke A**

9:20 - 9:30

The impact of ‘pushing’ on stroke rehabilitation outcomes.

A.S. Girgen, K. Chan, C.M. Tsicak
Oswestry Park Hospital Stroke Rehabilitation Unit, Perth, AUSTRALIA

BACKGROUND: Pusher Syndrome (PS) describes a clinical syndrome of postural impairment after stroke. Affected patients lean towards the hemiplegic side, may actively push towards that side, and even resist passive correction towards the midline. Information on prevalence, predictors and prognostic implications is sparse. METHODS: A retrospective analysis of the Oswestry Park Hospital Stroke Rehabilitation Unit database was undertaken. This record clinical characteristics, and a range of functional and outcome measures including Length of Stay (LOS) and Functional Independence Measure (FIM). Pushing was recorded on the Oswestry Park Scale (MPS), a 4-point nominal scale scoring 0 (no pushing), 1 (mild pushing), 2 (moderate pushing) or 3 (severe pushing); the scale includes specific descriptors for scoring, and has good inter- and intra-rater reliability. Statistical analyses included Chi Square testing for pusher group comparison, ANOVA analysis and linear regression for the effect of pusher status on outcome measures, and logistic regression analysis to determine the effect of MPS on discharge destination.

RESULTS: PS was common, present in 50.5% of 275 patients with full data available. Whilst presence and severity of pushing were associated with longer mean hospital LOS (24.4 d non-pushers; 43.3 d P< 0.05), all 4 groups on the MPS demonstrated significant functional gains during rehabilitation, with ultimately higher discharge FIM scores in non-pushers (101.92 cf 87.52 for PS; P< 0.05). Presence and severity of pushing both remained independent predictors of discharge FIM and longer LOS on multivariate analysis. PS was associated with a lower likelihood of discharge home, as opposed to residential care. (48.92% PS, vs 75.2% Np, P<0.0001).

CONCLUSION: Pusher syndrome after stroke predicts longer LOS, lower discharge FIM and greater likelihood of discharge to residential care. Significant and meaningful rehabilitation gains can, however, be achieved in even the most severe pushers.

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**7 Rehabilitation and reorganisation after stroke A**

9:30 - 9:40


J. Bernhardt, L. Congreve, L. Chaturvedi, T. Cumming
Stroke Division, Florey Neuroscience Institutes, Melbourne, AUSTRALIA; LA Troe University, Bundoora, AUSTRALIA

Background and Aims: Higher intensity therapy is intended to enhance outcome. In reality we know little about therapy levels in acute care and less about the factors that drive therapy delivery. We aimed to identify patient factors that influence the amount, frequency and intensity of physical therapy received by acute stroke patients.

Method: Studies that have monitored activity and therapy time of stroke patients treated in the first 14 days of stroke were explored. Patients admitted to a stroke unit were eligible. Procedure: Physiotherapists and Occupational Therapists recorded participants’ activity and therapy delivery for 14 days. therapy was scored as high-intensity if the total number of sessions delivered or median time per session was 20 minutes. Data were collected for all patients and divided into 4 groups: women; those born overseas; women born overseas; and the total group. Data were assessed using multivariable regression.

Results: 274 patients received a median total of 40.0 minutes of therapy per weekday. We found that women have less total therapy 0.78 (22%) (95% CI: 0.41-0.10, p<0.001) and a decreased likelihood of receiving two or more sessions (OR 0.69, 95% CI 0.53-0.98). Of the patient factors being significant were female (OR 0.78, 95% CI 0.41-0.10, p<0.001) and the group being born overseas (OR 0.5, 95% CI 0.34-0.8, p<0.001). Of the 4 groups women have the lowest amount of therapy and women born overseas have the lowest frequency of therapy and the greatest intensity of therapy.

Conclusion: Although most effects were small, there is evidence that some patient factors influence amount of therapy delivered to acute stroke patients. Physiotherapists and Occupational Therapists should be aware of potential biases as they deliver therapy.

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**8 Rehabilitation and reorganisation after stroke A**

9:40 - 9:50

Using researcher observation to monitor process indicators in acute stroke care

L.E. Craig, J. Bernhardt, O. Wei, P. Langhorne
University of Glasgow, Glasgow, UNITED KINGDOM; National Stroke Research Institute (part of Florey Neuroscience Institutes), Melbourne, AUSTRALIA

Background: A number of acute stroke care process indicators such as early mobilisation with 24 hours and multi-disciplinary team (MDT) involvement exist and are used to assess the quality of stroke care. Audits of such indicators often do little to further understand the complex process of acute stroke care. We used a triangulation of methods to examine key processes of care in 3 Scottish acute stroke units (ASUs).

Methods: We conducted an observational study involving intermittent researcher observation to collect information on objective and observable process indicators (activity/early mobilisation, MDT and relative/care involvement). Patients recruited were recorded on 10-minute intervals for 1 day. An ethnographic diary was used to describe staff activity and the ward environment. Focus groups and interviews were conducted with staff working in the ASUs. Interview transcripts and the diary were analysed thematically. Results: We recruited 66 patients to the observational study and 31 nurses, therapists and doctors were interviewed. Patients spent the majority of total observations sitting out of bed (54.2 hours) and sitting in bed (49.5 hours) but this was not routinely documented. One fifth of observations showed patients in contact with at least one member of the MDT. The greatest proportion of observations were of the patient at the bedside (89.8%). Staff speculated that a lack of ward space and recreational areas did not encourage activity beyond the bedside. Conclusions This study has illustrated how integrating quantitative and qualitative findings can provide an explanatory account of key processes of care. This is of particular importance when the implementation of a new intervention requires healthcare changes to change behaviour.

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**9 Rehabilitation and reorganisation after stroke A**

9:50 - 10:00

Evolution of Post-Stroke Aphasia and Dysarthria in Acute Stroke: Analysis of Data from the Virtual International Stroke Trials Archive (VISTA).

M. Ali, P. Lyden, M. Braddock
On Behalf of the VISTA Collaboration
NMAHP Research Unit, Glasgow Caledonian University, Glasgow, UNITED KINGDOM; Cedars-Sinai Medical Center, Los Angeles, USA

Introduction: Understanding the natural history of recovery from aphasia/dysarthria is vital to inform future intervention trials. Similarly important is the selection of appropriate global trial outcome assessment tools. We sought to describe the evolution of aphasia & dysarthria by 3 months post-stroke and to examine the association between these impairments and outcomes by modified Rankin Score (mRS) and European Quality of Life Score (EQ-SD).

Methods: We extracted anonymised data on patient demography, outcomes by mRS and EQ-SD from the Virtual International Stroke Trials Archive (VISTA). We defined aphasia and dysarthria at baseline as a score of ≥1 on the Ben-Langue and Dysarthria domains of the National Institutes of Health Stroke Scale (NIHSS) respectively. We defined recovery as a score of ≤1 at baseline followed by a score of 0 at 90 days. We used Proportional Odds Modelling to examine the association between aphasia & dysarthria at baseline and mRS and EQ-SD at 90 days, adjusting for age, stroke type, severity, medical history and thrombolysis. Results: At baseline 4039/8904 (45.4%) patients presented with aphasia and 6192/8904 (69.5%) with dysarthria. By 90 days 1530/8904 (17.2%) had died, 155/8904 (1.7%) were lost to follow up, 1292/7219 (17.9%) surviving patients had recovered from aphasia, while 2882/7219 (40.3%) dysarthric patients had recovered. The burden of persistent aphasia and dysarthria in surviving patients at 90 days was 1,713/7219 (23.7%) and 1,940/7219 (26.9%) respectively. After adjusting for confounding factors, aphasia (p<0.05, OR=0.89, 95% CI[0.79, 0.99]) and dysarthria (p<0.05, OR=0.92, 95% CI[0.81, 1.02]) were not independently associated with mRS or EQ-SD at 90 days. Conclusion: Almost 1 in 4 surviving patients experienced persistent aphasia/dysarthria at 3 months. Further investigation into the sensitivity of mRS and EQ-SD to detect the effects of aphasia may be important given gains in outcome may be underestimated.
Background: Prognostic blood biomarkers may improve risk stratification in patients with ischemic stroke. We aimed to evaluate the incremental value of copeptin in outcome prediction as compared to established clinical variables/scores.

Methods: Prospective, multicenter cohort study; Setting: Emergency and Neurology Departments of the University Hospitals of Bern and Basel, Switzerland; Goethe University, Frankfurt a.M., Germany; Medical University Department, Kantonsspital Aarau, Aarau, SWITZERLAND; Department of Clinical Chemistry, Thermo Fisher Scientific, Thermo Scientific Biomarkers, Clinical Diagnostics, Hennigsdorf-Berlin, GERMANY, EnfortC, Charité, University Hospital Berlin, Berlin, GERMANY; Department of Endocrinology, University Hospital of Basel, Basel, SWITZERLAND

Background: Prognostic blood biomarkers may improve risk stratification in patients with ischemic stroke. We aimed to evaluate the incremental value of copeptin in outcome prediction as compared to established clinical variables/scores.

Methods: Prospective, multicenter cohort study; Setting: Emergency and Neurology Departments of the University Hospitals of Bern and Basel, Switzerland; Goethe University, Frankfurt a.M., Germany; Medical University Department, Kantonsspital Aarau, Aarau, SWITZERLAND; Department of Clinical Chemistry, Thermo Fisher Scientific, Thermo Scientific Biomarkers, Clinical Diagnostics, Hennigsdorf-Berlin, GERMANY, EnfortC, Charité, University Hospital Berlin, Berlin, GERMANY; Department of Endocrinology, University Hospital of Basel, Basel, SWITZERLAND

Results: Of 1840 patients assessed by MRI (520) and/or CT (1317). Results were similar for each of the WMC scales used and for CT and MRI. WMC were associated with a worse premorbid mRS (adjusted OR for mRS=2; given WMC mild/severe on ARWMC scale=1.82, 95% CI 1.35-2.45, p=0.0001) and a greater risk of a worsening of mRS at one-year (OR=1.36, 1.02-1.83, p=0.04). Age-adjusted analyses of Barthel index domains showed particular associations with reduced pre-morbid mobility and continence. WMC were also associated with baseline MMSE<24 (OR=1.71, 1.19-2.47, p=0.004), but were unrelated to risk of recurrent ischemic stroke, although they did predict intracerebral haemorrhage (adjusted HR=2.89, 1.17-6.85, p=0.02). WMC were also independently associated with higher risk of death during follow-up, particularly in patients aged≥75 years (adjusted HR=1.76, 1.08-2.87, p=0.02).

Conclusions: In patients with TIA or stroke, WMC are associated with pre-morbid disability and baseline cognitive impairment and predict progression of disability during follow-up and risk of death, each independently of age, sex and vascular risk factors.

1 Stroke prognosis B
10:30 - 11:30
PROGNOSTIC VALUE OF WHITE MATTER CHANGES IN PATIENTS WITH TIA OR STROKE: A POPULATION-BASED STUDY
M. Simoni, L. Li, Z. Mehta, P.M. Rothwell
Nuffield Department of Clinical Neurosciences, University of Oxford, Oxford, UNITED KINGDOM

10:30 - 11:30
Academic Symposium 3
Auditorium VII

New developments in stroke research
Joint ESN/ESC Symposium
Chairs: S. Meairs, Germany and U. Dirnagl, Germany

Copeptin for Prediction of Functional Outcome, Mortality, and Complications in Patients with Ischemic Stroke: the CoRisk Study.
G. M. De Marchis1, M. Katan2, A. Weck1, F. Fluri3, C. Foerch4, O. Findling1, P. Schuetz5, D. Buhl6, M. El-Koussy6, M. Seiler7, N. Morgenthaler8, H. P. Mattle1, B. Mueller5, M. Christ-Crain
1 Department of Neurology, Inselspital, University of Bern, Switzerland, Bern, SWITZERLAND, 2 Department of Neurology, College of Physicians and Surgeons, Columbia University, New York, NY, USA, 3 Department of Neurology, University Hospital Basel, Basel, SWITZERLAND, 4 Department of Neurology, Goethe University, Frankfurt a.M., Frankfurt a.M., GERMANY, 5 Medical University Department, Kantonsspital Aarau, Aarau, SWITZERLAND, 6 Department of Clinical Chemistry, Thermo Fisher Scientific, Thermo Scientific Biomarkers, Clinical Diagnostics, Hennigsdorf-Berlin, GERMANY, 7 EnfortC, Charité, University Hospital Berlin, Berlin, GERMANY, 8 Department of Endocrinology, University Hospital of Basel, Basel, SWITZERLAND

Background: Prognostic blood biomarkers may improve risk stratification in patients with ischemic stroke. We aimed to evaluate the incremental value of copeptin in outcome prediction as compared to established clinical variables/scores.

Methods: Prospective, multicenter cohort study; Setting: Emergency and Neurology Departments of the University Hospitals of Bern and Basel, Switzerland; Goethe University, Frankfurt a.M., Germany; Patients: Patients with ischemic stroke and symptom onset within 24 hours; Main Endpoints: Primary endpoints: unfavorable functional outcome (modified Rankin Score – mRS) at 90 days, mortality at 90 days; Secondary endpoints: any complication, any stroke-related hospitalization, any hospitalization, any hospitalization due to pre-specified complications during hospitalization.

Results: Of 791 enrolled patients, 786 completed the follow-up (99.4%). Median copeptin concentration was more than three-fold higher in patients with unfavorable outcome compared to those with favorable outcome (32.25 pmol/l [interquartile range (IQR) 5.9–46.5] vs. 9.57 pmol/l [IQR 4.7–25.8], P < 0.001). In multivariate logistic analysis, higher copeptin independently predicted unfavorable outcome (OR 2.10 [95% CI 1.48–2.97], P < 0.001).

In non-survivors, median copeptin was more than five-fold higher than in survivors (58.80 pmol/l [IQR 23.00–141.00] vs. 11.70 pmol/l [IQR 5.55–35.10], P < 0.001). In multivariate logistic analysis, higher copeptin levels were independently associated with mortality (OR 2.89 [95% CI 1.84–4.54], P < 0.001). The combination of copeptin with the NIHSS led to an NRI of 48.2% compared to the NIHSS alone (P < 0.001). Concerning complications, the discriminatory ability of copeptin was in the range of the NIHSS but did not add predictive information.

Conclusions: Copeptin is the first validated blood marker in patients with ischemic stroke to add prognostic information on functional outcome and mortality beyond established clinical variables, in particular beyond the NIHSS.

2 Stroke prognosis B
10:45 - 12:15
Joint ESN/ESC Symposium
New developments in stroke research
Chairs: S. Meairs, Germany and U. Dirnagl, Germany

Can sports cause stroke?
E. Stolz, Germany

Fitness coaching in healthy elderly people and brain protection
M. Griebe, Germany

Towards a biochemical diagnosis of stroke
J. Montaner, Spain

Is passive football watching a risk factor for stroke?
J.Z. Willey, USA

Levels of physical activity, symptomatic and asymptomatic cerebrovascular disease
J.Z. Willey, USA

Does exercise have an impact on stroke risk?
J. Montaner, Spain

Can sports cause stroke?
J.M. Ferro, Portugal

Sports and stroke
Chairs: J.M. Ferro, Portugal and P. Langhorne, UK

Is passive football watching a risk factor for stroke?
J.Z. Willey, USA

Can sports cause stroke?
J.M. Ferro, Portugal

Fitness coaching in healthy elderly people and brain protection
M. Griebe, Germany

Physical activity after stroke
I.G. van de Port, The Netherlands

10:00 - 10:30 Coffee Break

10:30 - 12:30
Educational Symposium 2
Auditorium VI

10:30 - 12:30
Oral Session. Stroke prognosis B
Chairs: A. Carolei, Italy and M. Fatar, Germany
Results: BMI was significantly higher in men, nonsmokers, nondrinkers, diabetics, patients with hypertension, no previous stroke, ischemic stroke and patients living with someone. Within follow-up 7902 (26.9%) patients had a vascular recurrence.

Methods: We studied death and readmission for recurrent stroke in relation to Body Mass Index (BMI) in a Danish cohort of 29,326 stroke patients followed up to 5 years (median 2.4 years). Evaluation included stroke severity (Scandinavian Stroke Scale (SSS) 0-58), CT and cardiovascular risk factors. Stroke severity was divided into quartiles: SSS 0-36, 36-49, 49-55, >55. Survival of stroke patients were compared to survival in an age and sex matched Danish background population. Cox regression models to death adjusting for age, sex, stroke severity and cardiovascular risk factors were estimated.

Results: Mean age was 72.3 years, 48% women, 52% men. Compared to severe strokes (SSS 36-49) multivariate estimates of stroke severity on mortality adjusting for age, sex and risk factors was: SSS 36-49 (Hazard ratio (HR):0.45), SSS 49-55 (HR:0.31) and SSS >55 (HR:0.23).

In patients with severe strokes (SSS 0-36) cumulative survival was better in women than in men, in moderate strokes (SSS 36-55) it was the same while in the matched background population cumulative survival was consistently better in men. In mild strokes (SSS >55) cumulative survival was better in women than in men as also seen in the age and sex matched background population. Although cumulative survival was lower in men and women with severe/moderate stroke (SSS 0-55) compared to background, cumulative survival in women with mild stroke (SSS >55) was the same as that of the background population 1 year after stroke. In men with mild stroke survival was consistently lower than that of the background population.

Conclusion: Survival after stroke is not the same in men and women. In severe stroke it is better in men while mild stroke survival is better in women and even at the same level as that of the background population.

Stroke prognosis
11:00 - 11:10
Withdrawn!

5 Stroke prognosis
11:18 - 11:20
Acute lesion detectability on FLAIR before thrombosis is a predictor of hemmorrhagic transformation in ischemic stroke
Interdepartmental Stroke Network, Medical Center Rechts der Elbe, Klinik und Poliklinik für Neurologie, Caritas, Center for Health and Social Sciences, Leipzig, GERMANY

Background: A large proportion of acute stroke patients within the time window for thrombolysis show hypointensities on fluid attenuated inversion recovery (FLAIR) sequences corresponding to areas of diffusion restriction. The aim of this study was to determine whether acute lesion detectability on FLAIR was associated with hemorrhagic transformation (HT) after thrombolysis. Methods: Consecutive acute stroke patients between May 2005 and May 2010 from two stroke centers with known time of onset, who had stroke MRI before and one day after thrombolysis, were included in this study. All patients received thrombolysis within 4.5h. Blinded to follow-up imaging, stroke severity (NIHSS), and stroke extend independently judged FLAIR positivity. Stroke severity (NIHSS) and DWI lesion volume were assessed before and one day after thrombolysis. Presence of HT was assessed on T2* sequences of the second scan. Symptomatic intracerebral hemorrhage (SICH) was defined as any bleed associated with clinical deterioration of ≥4 NIHSS points. Multivariable logistic regression analysis was performed to identify predictors of HT including FLAIR positivity, stroke severity (Glasgow), stroke volume, and the NIHSS after thrombolysis. Results: Out of the 100 patients included in this study, 30% had visible lesions on acute FLAIR images (n=33). HT was seen in 17 patients (15.6%; eight H1-1, seven H1-2, two H1-1, two H2-1, two H2-2). Only one patient (FLAIR positive) had a SICH. FLAIR positive patients had significantly more HT than FLAIR negative patients (33.3% vs. 9.2%, p=0.01).

In univariate analysis comparing patients with and without HT including baseline parameters, only FLAIR positivity was significantly different (50% vs. 25%, p=0.017). In multivariable analysis only FLAIR hypointensity was independently associated with HT after thrombolysis (OR: 18.95, 95% CI 1.75 to 215, p<0.001). Conclusion: FLAIR hypointensity within the area of diffusion restriction is a strong predictor for HT after thrombolysis in acute stroke patients.

Stroke prognosis
11:20 - 11:30
Risk of rupture of intracranial aneurysms: a practical risk chart based on individual patient data from five prospective cohort studies.
Julius Center for Health Research and Primary Care, Radboud University Medical Center, Utrecht, THE NETHERLANDS, 1

Background: Although associated with excess mortality and morbidity obesity is associated with lower mortality after stroke. The association between obesity and stroke recurrence is unknown.

Methods: We studied death and readmission for recurrent stroke in relation to Body Mass Index (BMI) in a Danish cohort of 29,326 stroke patients followed up to 5 years (median 2.4 years). Evaluation included stroke severity (Scandinavian Stroke Scale (SSS) 0-58), CT and cardiovascular risk factors. Stroke severity was divided into quartiles: SSS 0-36, 36-49, 49-55, >55. Survival of stroke patients were compared to survival in an age and sex matched Danish background population. Cox regression models to death adjusting for age, sex, stroke severity and cardiovascular risk factors were estimated.

Results: Mean age was 72.3 years, 48% women, 52% men. Compared to severe strokes (SSS 36-49) multivariate estimates of stroke severity on mortality adjusting for age, sex and risk factors was: SSS 36-49 (Hazard ratio (HR):0.45), SSS 49-55 (HR:0.31) and SSS >55 (HR:0.23).

In patients with severe strokes (SSS 0-36) cumulative survival was better in women than in men, in moderate strokes (SSS 36-55) it was the same while in the matched background population cumulative survival was consistently better in men. In mild strokes (SSS >55) cumulative survival was better in women than in men as also seen in the age and sex matched background population. Although cumulative survival was lower in men and women with severe/moderate stroke (SSS 0-55) compared to background, cumulative survival in women with mild stroke (SSS >55) was the same as that of the background population 1 year after stroke. In men with mild stroke survival was consistently lower than that of the background population.

Conclusion: Survival after stroke is not the same in men and women. In severe stroke it is better in men while mild stroke survival is better in women and even at the same level as that of the background population.

Stroke prognosis
11:38 - 11:40
The obesity paradox in stroke: Lower mortality and lower readmission rate for recurrent stroke in obese than in normal weight stroke patients
T.S. Olsen, K.K. Andersen
Frederiksberg University Hospital, Frederiksberg, DENMARK, Danish Cancer Society Research Center, Copenhagen, DENMARK

Background: Predictive models of cardiovascular death influence of previous stroke is considered equal in men and women. We study survival after stroke in men and women related to initial stroke severity. Methods: Retrospective survival related to sex and stroke severity a Danish cohort of 40,021 stroke patients followed up to 5 years (median 2.4 years). Evaluation included stroke severity (Scandinavian Stroke Scale (SSS) 0-58), CT and cardiovascular risk factors. Stroke severity was divided into quartiles: SSS 0-36, 36-49, 49-55, >55. Survival of stroke patients were compared to survival in an age and sex matched Danish background population. Cox regression models to death adjusting for age, sex, stroke severity and cardiovascular risk factors were estimated.

Results: Mean age was 72.3 years, 48% women, 52% men. Compared to severe strokes (SSS 36-49) multivariate estimates of stroke severity on mortality adjusting for age, sex and risk factors was: SSS 36-49 (Hazard ratio (HR):0.45), SSS 49-55 (HR:0.31) and SSS >55 (HR:0.23).

In patients with severe strokes (SSS 0-36) cumulative survival was better in women than in men, in moderate strokes (SSS 36-55) it was the same while in the matched background population cumulative survival was consistently better in men. In mild strokes (SSS >55) cumulative survival was better in women than in men as also seen in the age and sex matched background population. Although cumulative survival was lower in men and women with severe/moderate stroke (SSS 0-55) compared to background, cumulative survival in women with mild stroke (SSS >55) was the same as that of the background population 1 year after stroke. In men with mild stroke survival was consistently lower than that of the background population.

Conclusion: Survival after stroke is not the same in men and women. In severe stroke it is better in men while mild stroke survival is better in women and even at the same level as that of the background population.
9 Stroke prognosis B
11:46 - 12:00
Smoking-thrombolysis paradox - reperfusion rates and relative infarct growth after IV-tPA in smokers with ischemic stroke
A.E. Küfter1, G. Küfter1, C.H. Nolte1, J. Galánovic2, J.B. Fiebach1, M. Endres1, M. Ebinger1
International Graduate Program Medical Neurosciences, Charité - Universitätsmedizin Berlin, Berlin, GERMANY1, Kingston Neurological Associates, Kingston, NY, USA1, Center for Stroke Research Berlin, Klinik und Poliklinik für Neurologie, Charité - Universitätsmedizin, Berlin, GERMANY1

Background: Smoking is a well-known risk factor for stroke. The so-called smoking-thrombolysis paradox of an improved response to tPA has been observed in smokers with myocardial infarction. We sought to determine whether reperfusion rates and clinical outcome differ between smokers and non-smokers with ischemic stroke after IV-tPA.

Methods: Consecutive acute stroke patients between May 2008 and May 2010, with known time of onset, who had an MRI before and one day after thrombolysis, were included in this study. All patients received IV-tPA within 4.5h. DWI lesion volume, and perfusion deficit were assessed before and one day after thrombolysis to determine relative infarct growth (DWI volume day 2/ baseline DWI volume), and reperfusion (75% reduction in perfusion deficit on day 2 compared to baseline). Perfusion deficit was defined as MTT >6 sec. MRA was used to evaluate arterial stenosis. Functional outcome was assessed 3 months after stroke using the modified Rankin Score.

Results: Out of 92 patients included in this study, 20% were smokers at the time of stroke (n=18). Smokers were younger (mean age 62 vs. 75, p<0.01), had lower baseline glucose levels (112 mg/dl vs. 123 mg/dl, p=0.01) and higher baseline perfusion deficits (63 ml IQR 16-138 vs. 15 ml IQR 2-50, p=0.03) than non-smokers. Baseline NIHSS and DWI lesion volume did not differ significantly between groups. Smokers had higher reperfusion rates (84% vs. 29%, p=0.03) and lower relative infarct growth than non-smokers (1.5 vs. 2.2, p=0.06). In a multivariable backward stepwise regression analysis including age, perfusion deficit, smoking, atrial fibrillation, and glucose, smoking had an odds ratio of 5 (95% CI 1.4 to 21, p=0.02) for reperfusion.

Conclusion: Smoking was associated with higher rates of reperfusion and reduced infarct growth indicating a causal treatment effect of tPA in patients with this risk factor.

10 Stroke prognosis B
12:08 - 12:10
Association between socioeconomic status and functional impairment 3 months after stroke: The Berlin Stroke Register (BSR)
M.M. Grube1, H.C. Kronenck1, G. Walter1, A. Meisel3, J. Thümmler3, I. Wellwood3, P.U. Heuschmann4

Background: People from lower socioeconomic groups have a higher burden of stroke in terms of incidence and case fatality rates. We aimed to analyse the association between patients' socioeconomic status and functional impairment 3 months after stroke.

Methods: Data were obtained from the Berlin Stroke Registry (BSR), a network of 14 stroke units covering about 80% of stroke patients in Berlin. Ischemic stroke patients who gave their informed consent were followed up by postal or telephone interview 3 months after the event. The overall participation rate was 66%, the follow-up rate was 82%. We used multivariable logistic regression to examine associations between highest education level as marker of socioeconomic status (SES) and functional impairment after stroke defined by the Barthel Index (BI) and adjusted for age, sex, pre-stroke dependency, functional deficit after stroke onset, comorbidities, complications and use of rehabilitation services as possible confounding factors. Results: Between 06/2010 and 07/2011, a total of 1032 patients who were alive at 3 months and completed the questionnaire were included in the analysis. Off the patients 42% were female and 50% were ≥75 years. 14% of the patients had a poor (BI 0-70), 26% of the patients a moderate (BI 71-95) and 60% of the patients had a good functional outcome (BI ≥100). In multivariable analysis patients had an increasing probability of good outcome with higher education level (OR 3.75; 95% CI 2.0 to 7.0 for patients with college or university degree compared to patients with no completed education). Age, pre-stroke dependency, functional deficit after stroke onset and use of rehabilitation services were also significantly associated with good functional impairment at 3 months.

Conclusion: Patients with lower SES have considerable lower rates of good functional outcome after stroke, which cannot be explained by variations in demographic and descriptive features or use of rehabilitation services.

11 Stroke prognosis B
12:18 - 12:20
The SAFE algorithm predicts upper limb recovery after stroke
C. M. Stine1, P. A. Barber1, M. A. Paton1, S. S. Anwar1, W. D. Byblow1
University of Auckland, Auckland, NEW ZEALAND1, Auckland District Health Board, Auckland, NEW ZEALAND1

Background: Stroke is a leading cause of adult disability, and the recovery of motor function is important for independence in activities of daily living. Predicting motor recovery after stroke for individual patients is difficult. Accurate prognosis would enable realistic rehabilitation goal-setting and more efficient allocation of resources. The aim of this study was to test the SAFE algorithm for predicting the potential for recovery of upper limb function after stroke.

Methods: Forty participants were prospectively enrolled within 3 days of ischaemic stroke. The SAFE score was calculated by grading shoulder abduction and finger extension strength 72 hours after stroke onset. Transcranial magnetic stimulation was used to assess the functional integrity of descending motor pathways to the affected upper limb. Diffusion-weighted MRI was used to assess the structural integrity of the posterior limbs of the internal capsules.

Results: Out of 92 patients included in this study, 20% were smokers at the time of stroke (n=18). Smokers were younger (mean age 62 vs. 75, p<0.01), had lower baseline glucose levels (112 mg/dl vs. 123 mg/dl, p=0.01) and higher baseline perfusion deficits (63 ml IQR 16-138 vs. 15 ml IQR 2-50, p=0.03) than non-smokers. Baseline NIHSS and DWI lesion volume did not differ significantly between groups. Smokers had higher reperfusion rates (84% vs. 29%, p=0.03) and lower relative infarct growth than non-smokers (1.5 vs. 2.2, p=0.06). In a multivariable backward stepwise regression analysis including age, perfusion deficit, smoking, atrial fibrillation, and glucose, smoking had an odds ratio of 5 (95% CI 1.4 to 21, p=0.02) for reperfusion.

Conclusion: Smoking was associated with higher rates of reperfusion and reduced infarct growth indicating a causal treatment effect of tPA in patients with this risk factor.

12 Stroke prognosis B
12:26 - 12:30
Long-term follow-up of patients with isolated Pontine infarcts.
Clinical and Radiological study.
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Background and Purpose: We conducted this study to evaluate the mechanisms, recurrence and prognosis of patients with isolated pontine infarcts.

Methods: We studied consecutive patients with confirmed diagnosis of isolated pontine infarct, and classified them into five subtypes on the basis of lesion location on MRI: 1) anterolateral pontine syndrome (ALPS); 2) anterolateral pontine syndrome (ALPS); 3) trigeminal pontine syndrome (TPS); 4) bilateral pontine syndrome (BPS); and 5) unilateral multiple pontine infarct (UMPI). Clinical features, radiological findings, and risk factors were...
Conclusions: We found significant differences in outcome, recurrence and mortality in the long-term follow-up of patients with pontine infarcts. AMPS is the most common form of presentation, mainly associated with hypertensive eye disease. Higher mortality was observed in BPS and AMPS groups.

Methods: We performed MRI of the brain (T1, T2, FLAIR and GRE sequences) at baseline in 1,185 patients and at follow-up in 926 participants enrolled in the A VERROES trial. The primary outcome of this analysis was a symptomatic intracerebral haemorrhage. We performed serial brain MRI scans in a subgroup of patients enrolled in A VERROES to explore the effect of apixaban compared with aspirin on the composite of symptomatic and covert cerebral microbleeds.

Results: A total of 164 patients were analyzed (mean age 60±15 years, range 39 to 86 years, 93 (57%) men and 71 (43%) women). AMPS was found in 115 (70%) patients, ALPS 21 in (13%); TPS in 13 (8%); BPS12 (8%); and UMPI in 3 (2%). In AMPS patients the most common clinical presentation was incomplete basilar pontine syndrome in 82 (71%), and pure motor hemiparesis in 30 (26%). Hypertension was the single most common and important risk factor, and the pathogenetic mechanisms of ischemia were likely to be small arterial (lacunar) occlusion or basilar atheromatous branch occlusion in most of the patients.

Conclusion: From our study, we conclude that AMPS is associated with recurrent stroke and higher mortality compared to ALPS and TPS. We also found that patients with AMPS and BPS had a better prognosis compared to ALPS and TPS. Hypertension was a strong risk factor for recurrent stroke and mortality in patients with AMPS and BPS. The pathogenetic mechanisms of ischemia were likely to be small arterial (lacunar) occlusion or basilar atheromatous branch occlusion in most of the patients.

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Atrial fibrillation (AF) is the most common cardioembolic cause of stroke. Most patients with stroke and AF should have oral anticoagulation (OAC). The long-term outcome of patients with or without OAC after AF-related stroke is unknown.

METHODS: We evaluated data from subjects in the 1st phase of TILDA to determine what proportion of the population had AF, what proportion of the population were aware of the diagnosis and whether patients with AF were more likely to die or require hospitalization compared to patients without AF.

Results: There were 82,950 ischemic stroke patients, out of whom 13,245 (16%) had AF registered prior to their stroke. Of these, 8,676 (66%) survived to go home, either straight from acute care, or after rehabilitation. Among these survivors, 5,907 (69%) were treated with warfarin after their stroke. The patients with warfarin had a longer median survival (7.2 vs. 3.4 years; p<0.001), but were younger and with less comorbidities. After adjusting for baseline characteristics with a Cox regression model, post-stroke warfarin use was still strongly associated with survival (HR 0.54 [95% CI 0.81 to 0.85]) and the median survival of patients on warfarin was longer than that of patients not on warfarin after their stroke (7.2 vs. 4.5 years; p<0.001).

Conclusions: In Finland, warfarin is used in routine practice in two thirds of AF patients who survive their ischemic stroke. After adjusting for baseline characteristics, patients on warfarin after their stroke live on average more than two years longer than patients not on warfarin.
10 Stroke prevention
12:00 - 12:10
Compliance and durability of blood pressure control for secondary stroke prevention in the International
T.L. Kennedy, R.L. Featherstone, D. Doug, M.M. Brown
on behalf of the ICSS Investigators
University College London Institute of Neurology, London, UNITED KINGDOM

Background: Population based studies have shown that patients with hypertension show poor compliance with antihypertensive drugs, with up to 50% of patients discontinuing hypertension medication after 5 years and less than one third of patients reaching target blood pressure (BP) readings. The International Cerebral Stenting Study (ICSS) protocol stated that patients should receive best medical care including control of risk factors such as hypertension throughout follow-up. We hypothesised that in a randomised clinical trial with annual hospital based follow up long-term compliance with medication and achieved BPs would be better than in routine practice.

Methods: Patient demographics, vascular risk factors and medications were recorded in ICSS at baseline, one month after treatment and then at annual follow up. We analysed medication records and compared BP recorded at the 5 year follow up against the European Stroke Organization guideline of 140/85 mmHg or lower.

Results: ICSS enrolled 1713 patients with recently symptomatic carotid stenosis between 2005 and 2008. By 2011, 582 patients had been followed for at least 5 years with BP data. At baseline 69% of patients in each group gave a history of treated hypertension. At 1 month, 599 patients allocated carotid endarterectomy (CEA) and 712 patients allocated carotid stenting (CAS) were on antihypertensive treatment. At 5 years 167 (83.9%, Fisher ex - act test, p=0.008) patients allocated CEA and 150 (87.2%, p=0.089) allocated CAS remained on treatment (p=0.581 for comparison of CEA vs. CAS). At 5 years, the median BP was 140/76mmHg in both groups.

Conclusion: Compliance with antihypertensive medication and achieved BPs at 5 years were considerably better than reported in population studies. However, half the patients still had BP levels above the ESO guideline. Even in the context of clinical trials, there is scope for better BP management. Implementation of BP control in ICSS was well balanced between the two arms.

11 Stroke prevention
12:10 - 12:20
Intensified Secondary Prevention for Patients with Minor Stroke or TIA Evaluation of usual care and development of a patient centered support program

Background: Effective methods of secondary prevention after stroke or TIA are available but adherence to recommended evidence-based treatments is often poor.

Methods: Two consecutive cohorts of acute minor stroke or TIA patients admitted to our institution undergoing usual outpatient care versus a secondary prevention support program were compared. Risk factor control and medication used were assessed in 6-month follow-ups. Usual care consisted of structured information given at discharge as well as regular outpatient care by general practitioners. The support program additionally emp loys a nurse to visit the patient and team from the Support Program to assist in the treatment of specific treatment goals. Results of risk factor measurements and assessed adherence to medical recommendations were shared with the patients. They were also offered assistance in finding appropriate physical activities or smoking cessation programs.

Results: The usual-care cohort comprised 255 patients (mean age 66 years, 38% female), admission mean blood pressure (BP): 155/88mmHg, six-month follow-up rate: 77%). 274 patients were included in the support pro gram (mean age 68 years, 37% female, admission BP: 161/84mmHg, six-month follow-up rate: 75%). Proportion of patients with BP according to guidelines of the German Stroke Society were 45% in usual-care and 67% in the support program (mean BP at 6 month: 137/79mmHg versus 127/73mmHg). LDL <100mg/dl was measured in 63% versus 71% respectively. Proportions of patients who stopped smoking were 48% versus 79% 70% versus 89% of patients with atrial fibrillation were on oral anticoagulation.

Conclusions: Targets of secondary prevention were met more often within the supported cohort. Effects on (cerebro-) vascular recurrence rates are going to be assessed in a multicenter randomized controlled trial.

12 Stroke prevention
12:20 - 12:30
Population based study of predictors of bleeding on aspirin-based antiplatelet treatment: towards a risk model
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Stroke Prevention Research Unit, Nuffield Department of Clinical Neurosciences, University of Oxford, Oxford, UNITED KINGDOM, University of Oxford, Oxford, UNITED KINGDOM

INTRODUCTION: Aspirin is widely used in secondary prevention after TIA, ischaemic stroke, and acute coronary syndromes (ACS), but there is a clinically important risk of major bleeding. Yet, although there are several validated scores for stratification of risk of ischaemic events, there is currently no routinely used score for bleeding risk in secondary prevention.

METHODS: We prospectively determined rates and severity (CURE trial criteria for major bleeds) of all bleeding events that presented to medical attention during follow-up in all patients on aspirin-based antiplatelet treat ment after TIA, stroke or ACS in the OXVASC study. A bleed risk model was derived and TIA patients and validated in ACS patients. Model discrimination was assessed using the area under the receiver operating curve (AUCROC) and the risk of recurrent ischaemic events (stroke, MI, sudden cardiac death) was also correlated with the predicted risk of bleeds.

RESULTS: Among 2043 patients on antiplatelet, (1946/2043,95% aspirin-based) treatment (1257 stroke/TIA, 786 ACS), 249 first bleeding events required medical attention during follow-up. Eight independent significant predictors of bleeding were identified in the stroke/TIA cohort (age, males sex, renal failure, frailty, prior vascular disease, prior cancer, prior GI bleed, prior peptic ulcer disease). The resulting model predicted the 3-year risk of major bleeding in the validation cohort (AUCROC=0.67, 95%CI 0.58-0.75, p<0.0001), particularly for fatal bleeds (0.76, 0.60-0.91, p<0.05) The 3-year risk of major bleeding increased from 3.0% to 22.3% across the quantiles of predicted risk, as did the risk of ischaemic events (13.9% to 35.8%).

CONCLUSION: Major bleeds on aspirin in secondary prevention are predictable. Although the risk of recurrent ischaemic events increased along with the risk of major bleeding, prediction is likely to be clinically useful in some patients.
Increasing the Proportion of Patients Treated with Stroke Thrombolysis: Reducing In-hospital Delays has Substantially More Impact than Extension of the Time Window

M.A. James, T. Monks, M. Pitk, K. Stein, Peninsula College of Medicine and Dentistry, Exeter, UNITED KINGDOM

Background: Meta-analyses show the benefit of IV alteplase for ischaemic stroke up to 4.5 hours from onset, and international guidelines have been updated to reflect this. However, the benefit of alteplase is critically time-dependent, and any additional benefit from extending the time window may be jeopardised by in-hospital delays.

Methods: We evaluated treating at our hospital over two years to April 2011, modelling time spent in the ED, brain imaging and, if applicable, thrombolysis. Outputs included arrival to treatment time (ATT), % of strokes thrombolysed, and number of thrombolysed patients with a 90 day modified Rankin Scale (mRS) of 0-1. We compared current stroke pathway with scenarios including extending treatment from 3 to 4.5 hours, ED-alerting the stroke team at triage, ambulance pre-alert to the stroke team, and combinations of these measures.

Results: The treatment window modestly increases the thrombolysis rate at 3% (CI 0.9-15.7), but the ambulance pre-alert reduces ATT by 27 mins (CI 26.3-28.4) compared to triage alert. Ambulance pre-alert increases the number of thrombolysed patients with mRS 0-1 by 28% (CI 27-29) compared to 25 (CI 24-26) with triage alert. Combining the time window extension with either alerting measure does not increase the thrombolysis rate further (15%, CI 14.7-15.1).

Conclusions: The greatest disability benefit accrues from measures to substantially reduce in-hospital delays to thrombolysis - a potential three-fold increase in the proportion of patients treated. Compared to extending the time window for alteplase, eradicating in-hospital delays offers a four-fold greater disability benefit, and this should be the pre-eminent focus for all acute stroke centres.

In Hospital Stroke: a neglected area of hyperacute stroke care?

J. Choyi, K.N Ramesh, L. Kalra, D. Manawadu, Kings college hospital, London, UNITED KINGDOM

Background and Purpose: In hospital stroke (IHS) account for 6-15% of all first strokes. Most hospitals do not have well-defined pathways of fast-track management of IHS, which may result in delays and poor outcome. We compared referral patterns, symptom onset to treatment times and outcomes after thrombolysis of IHS patients compared with Out of Hospital Stroke (OHS) patients, fast tracked to the Emergency Department.

Methodology: Registry data between January 2009 and December 2010 was analysed for patients thrombolysed within 0-4.5 hours of stroke onset. The clinical and imaging characteristics, outcomes and time durations between symptom onset and recognition, presentation to specialist care, imaging and treatment were compared between OHS and IHS patients with no upper age limit for thrombolysis.

Results: The analysis included 255 patients thrombolysed OHS and 20 thrombolysed IHS patients. The two groups were comparable for mean age (71.9 v 74.0, years, p=0.53) and sex (49% v 55%). IHS patients were more severe at baseline and incurred greater delays to assessment and treatment. Although sICH rates and functional outcomes were similar to the OHS group, mortality was significantly higher in IHS patients (20% v 45%, p=0.01).

Conclusions: IHS patients have a greater stroke severity at baseline and incur greater delays to assessment and treatment. Although sICH rates and functional outcomes were similar to the OHS group, mortality was significantly higher in IHS patients. The role of fast track pathways in improving assessment and outcome parameters in IHS patients needs to be evaluated.
Aims of our study was to identify the frequency of post stroke infections in the early phase of thrombolysed stroke patients and to analyze their effect on the outcome after 3 months.

Methods
From 1998 to 2011, all stroke patients treated with tPA were included into a prospective database. Baseline variables, clinical, radiographic and laboratory data were collected prospectively. Outcome measures included sICH, mortality and mRS at three months.

Background
Infections are common complications in patients with acute ischemic stroke and are associated with increased mortality and longer hospital stay. It remains unclear if infections occurring in the first 7 days have an effect on the overall functional outcome.

Aims
The aim of this study was to determine the frequency of post stroke infections in the early phase of thrombolysed stroke patients and to analyze their effect on the outcome after 3 months.

RESULTS
In our cohort, post stroke infections were frequent in patients with a severe cardio embolic stroke, a large infarct and a longer hospital stay; those patients have a higher risk of infection and a poorer functional outcome after 3 months. This risk increases after occurrence of sICH. Prevention of infection with antibiotic therapy or other prophylactic treatment could potentially lead to a better functional outcome.

CONCLUSIONS
The risk of infections after stroke thrombolysis is high and the risk increases if there is sICH or if the stroke is cardioembolic. Prevention of infection could lead to better functional outcome.
**10 Acute stroke: emergency management, stroke units and complications B**

**SUB-THERAPEUTIC WARFARIN TREATMENT IS ASSOCIATED WITH AN INCREASED RISK OF SYMPTOMATIC INTRACRANIAL AND MAJOR SYSTEMIC BLEEDINGS AFTER INTRAVENOUS THROMBOLYSIS FOR ISCHEMIC STROKE**

M. Ruecker, B. Matosevic, P. Willibels, M. Kirchmayr, A. Zangerle, M. Knoflach, J. Williet, S. Kiechl

Universitätsklinik für Neurologie, Medizinische Universität Innsbruck, Innsbruck, AUSTRIA

Background and Purpose: To quantify the risk for bleeding complications after thrombolysis for ischemic stroke in patients on warfarin (INR>1.7) and to put these data into perspective with previous studies.

Methods: A total of 548 consecutive stroke patients receiving intravenous rtPA were prospectively evaluated and details about warfarin pretreatment were carefully recorded. PT-based INR values were measured before thrombolysis and 6 and 24 hours thereafter. Intracranial hemorrhage occurring within 72 hours was assessed by CT examinations and defined according to NINDS criteria. Main outcome variables were symptomatic intracranial and major systemic bleedings. Additionally, a literature review was performed and we searched the abstract book of the most recent European Stroke Conference. Eligible papers were carefully extracted, reviewed and meta-analysis was performed (Odds ratios and 95% CI were calculated based on two-by-two contingency tables of warfarin therapy (yes/no) and subsequent intracranial hemorrhage (yes/no)).

Results: Of the 548 patients 33 (6.0%) and 14 (2.6%) experienced symptomatic intracranial and major systemic bleedings, respectively. Patients taking warfarin until the day of or day before admission (n=15, mean±SD INR 1.21±0.32 vs. 1.0±1.12, P=0.03) faced an approximately 4-fold risk for intracranial hemorrhage (20.0% vs. 5.6%, unadjusted OR [95%CI] 4.2 [1.1-15.7], P=0.013). Findings were similar after adjustment for age, NIHSS score and diabetes (adjusted OR [95%CI] 4.1 [1.6-10.6], P=0.044) and when focusing on any major bleeding (intracranial or systemic) (unadjusted OR [95%CI] 4.1 [1.3-13.6], P=0.019). Half of the patients with bleedings showed an INR rise above 1.7 six hours after thrombolysis. Meta-analysis yielded confirmatory yet heterogeneous results (unadjusted OR [95%CI] derived from a random effects model, 2.31 [1.15-4.62], P=0.018, I2=58% [11%-80%]).

Conclusions: Our data suggest a statistically significant and clinically meaningful increase in the risk for symptomatic intracranial and major systemic bleedings among patients with stroke thrombolysis receiving warfarin up to the day of or day before stroke.

**11 Acute stroke: emergency management, stroke units and complications B**

**EFFECT OF PRETREATMENT WITH STATINS ON ISCHEMIC STROKE SEVERITY: DOES THE DOSES MATTER?**


Department of Neurology and Stroke Centre. La Paz University Hospital. IDIPAZ Research Institute, Madrid, SPAIN

**OBJECTIVE:** To examine the effect of pre-treatment with statins, at high (80 mg) and non-high (<80 mg) doses, on ischemic stroke (IS) severity in clinical practice.

**METHODS:** prospective study of IS admissions to our Stroke Unit during a 3-year period (2008-2010). Demographic data, vascular risk factors, previous treatments (statins, ACE inhibitors, ARB, antithrombotic drugs), stroke severity (NIHSS), stroke subtype, in-hospital complications, length of stay and functional status at discharge (mRS) were collected. Mild stroke severity was defined as NIHSS < 5 on admission. Good outcome was defined as mRS < 2 at discharge. Multivariable regression models and matched propensity score analyses were used to quantify the association of statin pretreatment, at high and non-high doses, with a mild stroke severity.

**RESULTS:** Of 909 IS patients, 23% were using non-high doses and 4.3% high doses of statins before the stroke event. Statins were associated with lower NIHSS scores on admission (median [IQR], 4 [9] for non-patients vs. 4 [9]) for non-high doses of statins and 2 [4] for high doses of statins, p<0.010). The frequency of mild stroke on admission was higher in the statin groups (57.9% for non-statins, 63.2% for non-high doses of statins and 77.5% for high doses of statins, p=0.026). High doses of statins were related with favourable outcomes at discharge, although this was not statistically significant (66.6% for non-statins group, 64.7% for non-high doses of statins and 75% for high doses of statins, p=0.443). After multivariable adjustment, pretreatment with statins was associated with higher odds of mild stroke severity and this effect was greater at high doses (OR=1.637, 95% CI 1.156-2.319 for the non-high doses and OR=3.297, 95% CI 1.480-7.345, for the high doses of statins).

**CONCLUSION:** Pretreatment with statins is associated with lower stroke severity and this effect could be greater at higher doses.

**12 Acute stroke: emergency management, stroke units and complications B**

**DOES CLINICAL SEVERITY IN ACUTE STROKE RELIABLY PREDICT LARGE VESSEL OCCLUSION? RESULTS FROM A PROSPECTIVE COHORT STUDY OF CT-ANGIOGRAPHY (CTA) IN HYPER-ACUTE STROKE.**

H. Christensen, C.K. Hansen, I. Havsteen, A.F. Christensen

Bispebjerg University Hospital, Copenhagen, DENMARK

Background and aim: The availability of endovascular services is increasing, but still not available in the majority of TPA centres. The aim of this study was to describe the relations between NIHSS and large vessel occlusions in patients with hyper-acute ischemic stroke.

Methods: A prospective single hospital registry based on consecutive patients admitted for TPA workup with routine CTA was started on July 1 2009; this analysis is based on patients admitted before May 2011. Bispebjerg University Hospital has a TPA-service with a catchment area of app. 1.1 mio. inhabitants on even dates. CT scans are performed using 64-section MDCT (Brilliance-64, Philips Healthcare) with CTA from the aortic arch to the vertex. All images were systematically reviewed by a blinded neuroradiologist; 409 patients with acute ischaemic stroke were entered into the registry. Sensitivity, specificity, positive predictive value and negative predictive values were calculated at all levels of NIHSS. Results: Sensitivity, specificity, positive predictive value and negative predictive values are presented in Figure 1. At a NIHSS score ≥10 the sensitivity was equal to 56.1% [46.9%-65.5%], the specificity was 90.5% [86.9%-93.3%], the positive predictive value was 63.0% [57.0%-75.0%] and the negative predictive value was 83.7% [79.8%-87.4%] in predicting an acute occlusion.

**FIG. 1: Positive predictive values, negative predictive values, sensitivity and specificity of NIHSS as an independent predictor of acute large vessel occlusion.**
1 Intraoperative stroke and neurointerventional neuroradiology
10:30 - 10:40
Predictors for persistence of peri-procedural ischemic brain lesions at follow-up among patients randomized to stenting or endarterectomy for symptomatic carotid stenosis


Background: In the International Carotid Stenting Study (ICSS), patients with symptomatic carotid stenosis were randomly assigned to CAS or CEA. The occurrence of peri-procedural hemodynamic depression (defined as severe bradycardia, asystole, or arterial hypertension requiring treatment), hypertension requiring treatment, and the cerebral hyperperfusion syndrome (CHS) was assessed in a pre-procedural protocol. We compared the rate of hemodynamic complications between groups, determined independent predictors of hemodynamic complications, and assessed their relation with the composite outcome of all-cause death, stroke, and myocardial infarction within 30 days after treatment. Results: 766 CAS and 819 CEA patients had a single completed MRI scan within 30 days after the procedure. CHS occurred in 13.8% of the CAS patients and in 7.2% after CEA (relative risk (RR), 1.9; 95%CI, 1.4 to 2.6; p<0.001). CHS occurred less often after CAS than after CEA (RR, 0.2; 95%CI, 0.1 to 0.4; P<0.0001). CHS occurred infrequently in both groups. In CAS patients, a history of cardiac failure was the strongest independent predictor of hemodynamic depression (RR, 2.4; 95%CI, 1.3 to 4.5), while a history of diabetes and the use of antiplatelet agents or anticoagulants and severe hypertension were independently associated with a higher risk of hypertension requiring treatment after each of the interventions. There was no statistically significant association between hemodynamic complications and the occurrence of the composite outcome. Conclusion: Hemodynamic depression occurs more often after CAS and severe hypertension more often after CEA, but these complications are not responsible for the excess of major periprocedural events after CAS. Baseline SBP is the only modifiable determinant for hemodynamic complications. Clinical Trial Registration Information URL: http://www.controlled-trials.com. ISRCTN25317470.

2 Stroke surgery and neurointerventional/neurointerventional neuroradiology
10:40 - 10:50
Effects of carotid endarterectomy and stenting on early hemodynamic complications in the International Carotid Stenting Study: a randomized comparison


UMC Utrecht, Utrecht, THE NETHERLANDS, UCL, London, UNITED KINGDOM

Background: The incidence of complications associated with carotid artery stenting (CAS) and carotid endarterectomy (CEA) in the International Carotid Stenting Study. Methods Patients with symptomatic carotid stenosis were randomly assigned to CAS or CEA. The occurrence of peri-procedural hemodynamic depression (defined as severe bradycardia, asystole, or arterial hypertension requiring treatment), hypertension requiring treatment, and the cerebral hyperperfusion syndrome (CHS) was assessed in a pre-procedural protocol. We compared the rate of hemodynamic complications between groups, determined independent predictors of hemodynamic complications, and assessed their relation with the composite outcome of all-cause death, stroke, and myocardial infarction within 30 days after treatment. Results: 766 CAS and 819 CEA patients had a single completed MRI scan within 30 days after the procedure. CHS occurred in 13.8% of the CAS patients and in 7.2% after CEA (relative risk (RR), 1.9; 95%CI, 1.4 to 2.6; p<0.001). CHS occurred less often after CAS than after CEA (RR, 0.2; 95%CI, 0.1 to 0.4; P<0.0001). CHS occurred infrequently in both groups. In CAS patients, a history of cardiac failure was the strongest independent predictor of hemodynamic depression (RR, 2.4; 95%CI, 1.3 to 4.5), while a history of diabetes and the use of antiplatelet agents or anticoagulants and severe hypertension were independently associated with a higher risk of hypertension requiring treatment after each of the interventions. There was no statistically significant association between hemodynamic complications and the occurrence of the composite outcome. Conclusion: Hemodynamic depression occurs more often after CAS and severe hypertension more often after CEA, but these complications are not responsible for the excess of major periprocedural events after CAS. Baseline SBP is the only modifiable determinant for hemodynamic complications. Clinical Trial Registration Information URL: http://www.controlled-trials.com. ISRCTN25317470.

3 Vascular surgery and neurointerventional/neurointerventional neuroradiology
10:40 - 11:00
Assignment of patients with symptomatic carotid artery stenosis to endarterectomy or stenting based on predictive risk modelling may reduce periprocedural risk associated with carotid recanalisation: a post-hoc analysis of the SPARQ trial

M. Rosenblat, J. Berger, G. Thomalla, R. Stingele, G. Frudek, E.S. Debey, J. Feihler, O. Janzen, P.A. Ringley, C. Gerloff

on behalf of the SPARQ investigators

Dept. of Neurology, University Hospital Ludwig Maximilian University, Muenchen, GERMANY, 1 Dept. of Vascular Surgery, University Hospital Innsbruck, Innsbruck, AUSTRIA, 2 Dept. of Vascular Surgery, University Medical Center Hamburg-Eppendorf, Hamburg, GERMANY, 3 Dept. of Neurology, University Medical Center Hamburg-Eppendorf, Hamburg, GERMANY

Background: The SPARQ (Screening, Planning, and Risk Assessment for Carotid Revascularisation) trial assessed that this might have abolished the effect of the risk factors. We therefore analysed the effect of patient and procedural factors on perioperative outcome in patients undergoing CEA for symptomatic stenosis in the International Carotid Stenting Study (ICSS). Methods: Patients with recent symptomatic carotid artery stenosis ≥50% were randomly assigned to CAS or CEA. The composite end-point of stroke, death, or myocardial infarction (MI) within 30 days of the procedure was assessed in a pre-procedural protocol. We calculated the incidence of event between the procedure and the occurrence of the end point, and the difference in date between discharge and the endpoint. Results: In the first 30 days after the procedure, independently associated with the risk of PO with stenting and were included into the risk score model: age, hypertension, ischemic lesions in ipsilateral carotid territory, and plaque echolus

4 Vascular surgery and neurointerventional/neurointerventional neuroradiology
11:00 - 11:10
Timing of peri-procedural major events associated with recanalisation in the International Carotid Stenting Study (ICSS)

D. Doig, H.B. van der Worp, R.L. Featherstone, M.M. Brown

for the International Carotid Stenting Study Investigators

Vascular surgery and neurosurgery/interventional neuroradiology

Background: Registries and case series often assume that events after carotid stenting (CAS) or endarterectomy (CEA) occur before discharge. It has also been suggested that it is safe to discharge a patient on the day of or day after recanalisation. To test these assumptions, we determined the timing of major perioperative events in patients in the International Carotid Stenting Study (ICSS). Methods: Patients with recent symptomatic carotid artery stenosis ≥50% were randomly assigned to CAS or CEA. The composite end-point of stroke, death, or myocardial infarction (MI) within 30 days of the procedure was assessed in a pre-procedural protocol. We calculated the incidence of event between the procedure and the occurrence of the end point, and the difference in date between discharge and the endpoint. Results: In the first 30 days after the procedure, independently associated with the risk of PO with stenting and were included into the risk score model: age, hypertension, ischemic lesions in ipsilateral carotid territory, and plaque echolus
Cerebral embolism in endarterectomy versus stenting for symptomatic carotid artery stenosis: the significance of plaque morphology on duplex ultrasound
A. Buusor1, P. Lyer3, P. Nederkoorn1, M.M. Brown1, R. Struijker1, S. Engelter1, L.H. Bonati1
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Background
Carotid stenting (CAS) and carotid endarterectomy (CEA) may be complicated by cerebral embolism which often remains clinically silent. Unstable carotid plaques might increase the risk for peri-procedural embolism. We studied whether quantitative assessment of carotid plaque echogenicity predicts the risk of cerebral ischemia during CAS or CEA.

Methods
In 50 consecutive patients with symptomatic carotid stenosis randomised to CAS (n=26) or CEA (n=24) in the International Carotid Stenting Study, semi-automated grey scale measure of carotid plaque echogenicity was performed. Grey-scale median percentage of plaque area >20th percentile of grey-scale values, and an echographic risk index based on degree of stenosis and plaque area below the 20th percentile of grey-scale values were determined, both for the entire plaque and plaque surface. Brain MRI including diffusion-weighted imaging (DWI) was performed within 7 days before and 3 days after treatment as part of the ICSS-MRI substudy. The primary outcome on MRI was the presence of at least 1 new hyperintense DWI lesion after treatment.

Results
In the CAS group, patients with new DWI lesions after treatment (n=18) had significantly higher whole-plaque echographic risk indices at baseline (mean 0.1059) than patients without new lesions (n=8; mean 0.0263; p=0.02). GSM was 26.7 for patients with and 34.3 for patients without lesions (p=0.16). Other measures of plaque echogenicity did not differ significantly. In the CEA group, there were no significant differences in plaque echogenicity measures between patients with (n=2) and those without DWI lesions (n=22).

Conclusion
Our results show that among patients treated with CAS, the echographic risk index was higher in patients with new ischemic brain lesions after treatment than in those without new lesions. Quantitative ultrasound plaque analysis may be helpful in estimating the risk of embolic complications in CAS.

7 Vascular surgery and neurosurgery/interventional neuroradiology
11:30 - 11:40
Changes in duplex ultrasound measured flow velocities following carotid artery revascularization: a randomized comparison
B.L. Reichmann1, W.E. Hellings1, H.B. van der Worp1, A. Algra1, M.M. Brown1, F.L. Moll2, KINGDOM3, W.P. Moll1, G.J. de Bort1
University Medical Center Utrecht, Utrecht, THE NETHERLANDS1, St. Antonius Hospital, Nieuwegein, THE NETHERLANDS2, Institute of Neurology, University College London, London, UNITED KINGDOM3

Objective
Observational studies suggest a larger increase in flow velocities in the internal carotid artery as measured with duplex ultrasound (DUS) during follow-up after carotid angioplasty with stenting (CAS) than after endarterectomy (CEA). We compared changes in flow velocities following CAS and CEA in the International Carotid Stenting Study (ICSS; ISRCTN25337474). Methods: Of 270 patients enrolled in ICSS at the University Medical Center Utrecht, 254 patients (69% male; 129 CAS, 125 CEA) were included in the present study. Mean Peak Systolic Velocities (PSVmean) of the ipsilateral and contralateral internal and common carotid artery (ICA and CCA) were assessed at baseline 30 days after revascularization, and at 12 and 24 months after revascularization. >50% restenosis was defined as PSVmean ≥ 125 cm/s. Results: CAS and CEA resulted in a similar reduction in PSV. Flow velocities did not change during follow-up. During follow-up, the ICACC ratio increased after CAS but not after CEA: 1.18 ± 1.14 (mean diff. 0.04, 95% CI -0.14-0.25) at 30 days; 1.50 vs. 1.11 (mean diff. 0.39, 95% CI 0.13-0.65) at 12 months; and 1.45 vs. 1.09 (mean diff. 0.36, 95% CI 0.08-0.63), at 24 months, for CAS versus CEA. The rate of apparent ipsilateral ICA restenosis >50% after 2 years of follow-up was significantly higher following CAS (22.6% vs. 17.5%). Conclusion: In the first 2 years after carotid revascularisation, flow velocities in the ICA do not differ between CAS and CEA. However, the ICA/CCA ratio increased more following CAS than after CEA. This indicates the rate of apparent ipsilateral ICA restenosis to greater than 50% was significantly higher following carotid artery stenting. These results will need confirmation in ICSS as a whole.

8 Vascular surgery and neurosurgery/interventional neuroradiology
11:40 - 11:50
Carotid endarterectomy for carotid artery stenosis with high carotid bifurcation
T. Ono1, T. Mizutani1
Department of Neurosurgery, Tokyo Metropolitan Tama Medical Center, Tokyo, JAPAN

Background
High carotid bifurcation is one of the high risks for carotid endarterectomy (CEA). We have performed CEA for patients with carotid bifurcation and have obtained good surgical results. Here, we describe an improved surgical procedure, which involves the application of basic techniques. Subjects: Of the 481 patients (552 operations) with carotid stenosis, for whom surgical treatment was performed between Jan 1997 and Sep 2011, we reviewed 108 cases with carotid bifurcation higher than the C2 body. Of these patients, 92 were men and 16 women, and their mean age was 71.8 years. 37 patients were symptomatic. The distal end of the stenosis was located as follows: C1 (1 case), C2 upper (9 cases), C2 body (35 cases), and C2 lower (65 cases). Methods: We performed transnasal intubation. A skin incision was made, extending to the mastoid process. We then dissected the soft tissue between the stenosed muscle (SCM) and the digastric muscle (DM) and opened the retromandibular space. The DM and hypoglossal nerve were lifted medially. The carotid sheath was opened and lifted with strings, and then the distal portion of the internal carotid artery (ICA) was drawn into the frontal and superficial operative field. When necessary, we cut the occipital artery in order to maintain a wider operative field. To open these arteries with a short neck, a mouthpiece was specially crafted preoperatively, and we used mandibular subluxation to expose the distal ICA. Results: In all cases, we were able to confirm the distal end of the ICA plaque and complete CEA. An internal shunt tube was used in 44 cases. Postoperative complications were as follows: continuous dysphagia (1 case), deviation of the tongue (2 cases), wound hematoma (1 case), and hemiparesis (2 cases; transient, 1 continuous). Conclusion: Stroke prophylaxis among all cases at our department was 1.8% (and 0% in the 250 most recent cases). Using our techniques, the distal end of the ICA was exposed widely and the surgical risk of postoperative dysphagia and hoarseness was lower. Our techniques is useful for carotid stenoses with a high carotid bifurcation.

9 Vascular surgery and neurosurgery/interventional neuroradiology
11:50 - 12:00
Anatomical features and clinical outcomes of 48 distal anterior cerebral artery aneurysms
H. H. Hwang1, J. W. Choi1, I. Y. Shin1, J. H. Jeong1, S. M. Moon2
Hangang Sacred Heart Hospital, Hallym University, Seoul, SOUTH KOREA

Background
This study presents 48 managed such patients, with special attention given to the clinical and radiological characteristics, as well as the outcomes of surgical and endovascular treatment. Methods: A total of 481 patients with cerebral aneurysms were treated from January 2003 to May 2011 in Hallym medical center. Data was reviewed included the patient’s age, gender, Hunt and Hess grade, characteristics of the imaging study, procedure related complications and clinical outcomes. Aneurysm locations were divided into three groups (group I: pericallosal-carotid marginal[PerA-CMA] superficial,above the genu of corpus callosum) type, group II: pericallosal-carotid marginal[PerA-CMA] inferior(below the genu of corpus callosum) type and group III: pericallosal-frontobasal [PerA-FPA] type. Results: A total of 48 patients with DACA aneurysms were included in the study. Conventional or CT-angiography revealed that group I 18(37.5%), group II 24(50%) and group III 6(12.5%) respectively. 11(23%) patients had multiple aneurysms. 7(14.5%) patients had azygous variation on distal anterior communicating artery. 16(33.3%) patients underwent endovascular coiling; 33(68.7%) patients underwent microsurgical treatment. Initial mean GCS of
10 Vascular surgery and neurosurgery/interventional neuroradiology
12:00 - 12:10
A Novel Three-Dimensional Revascularization Device: Histopathology Results from a Rabbit Model and Early Clinical Experience with the Penumbra Separator 3D

T. Iwata, T. Mori, H. Tajiri, Y. Miyazaki, M. Nakazaki, K. Mizogami
Department of Stroke Treatment, Showa Kamakura General Hospital Stroke Center, Kamakura, JAPAN
Methods: To evaluate vascular effects of multiple 3D deployments and resheathings, a rabbit histology study examined right and left subclavian arteries from 5 rabbits 30 days after 8 cycles. Vessels were subjected to histopathology analysis.
Results: Case experience in 6 European centers was collected in the first 30 days post-device approval. Fourteen consecutive patients were treated. Five cases involved ICA to MCA (M1 or M2) occlusion; 4 involved M1 segmental occlusion; 2 involved M1 to M2 occlusion; 1 involved basilar to PCA occlusion; 2 were excluded due to underlying stenosis. In stenotic cases, use of 3D followed by stent-based retrievers like Solitaire (Covidien), Trevo (Stryker), and Restore (Reverse Medical) could not achieve revascularization; they were resolved by balloon or stent. Results: Multiple 3D deployments and resheathings in the rabbit revealed no histopathologic lesions at a magnification of 500 µm nor evidence of injury or inflammation in the internal elastic lamina. Importantly, no intraluminal fibrin or thrombus was found.
Conclusion: These results indicate that the Penumbra 3D is a safe, effective revascularization device.

11 Vascular surgery and neurosurgery/interventional neuroradiology
12:10 - 12:20
Significant increase of immediate post-CAS whole-brain oxygen extraction fraction in cases of hyperperfusion syndrome after carotid artery stenting
T. Tsuta, T. Mori, H. Tajiri, Y. Miyazaki, M. Nakazaki, K. Mizogami
Department of Stroke Treatment, Showa Kamakura General Hospital Stroke Center, Kamakura, JAPAN
Methods: We studied patients with middle cerebral artery occlusion undergoing acute endovascular treatment. Initial angiograms were reviewed and graded using a previously published pial collateral grading system. The collateral grading system was dichotomized into good and poor. Statistical analysis was performed to study which baseline clinical variables are associated to good collateral flow.
Results: Multiple 3D deployments and resheathings in the rabbit revealed no histopathologic lesions at a magnification of 500 µm nor evidence of injury or inflammation in the internal elastic lamina. Importantly, no intraluminal fibrin or thrombus was found.
Conclusion: These results indicate that the Penumbra 3D is a safe, effective revascularization device.

12 Vascular surgery and neurosurgery/interventional neuroradiology
12:20 - 12:30
A clinical profile of pial collateral status. The role of patients in on the extent of pial collaterals in acute ischemic stroke patients
Vall d’Hebron Hospital, Barcelona, SPAIN
Methods: We studied patients with middle cerebral artery occlusion undergoing acute endovascular treatment. Initial angiograms were reviewed and graded using a previously published pial collateral grading system. The collateral grading system was dichotomized into good and poor. Statistical analysis was performed to study which baseline clinical variables are associated to good collateral flow.
Results: Pial collateral flow was graded in 98 patients, 48% female, mean age was 71.3 years, median NIHSS 19 (IQ:4). We found an significant inverse relation between the NIHSS score and the grade of pial collaterals (95% CI 11.4-4.5 p<0.01). A ROC curve showed that an NIHSS≥21 predicted poor collateral (S:61%; E:80%). Among stroke subtypes, only cardioembolic strokes were associated with poor collateral flow. Prior use of statins was associated with good collateral flow only in non cardioembolic strokes (80% Vs 20%; p<0.015). A logistic regression with the NIHSS showed not relation of prior use of statins with good collateral (p= 0.11). We didn’t found in the rest of baseline variables a significant relation with the grade of collaterals. Conclusion: Our study showed a strong association between baseline NIHSS stroke and collateral flow status. In non cardioembolic strokes prior use of statins was associated with better collateral circulation.
12:45 - 14:15  Lunch Satellite Symposium Boehringer Ingelheim/ Medtronic  
Auditorium I

Leading the revolution: improving clinical practice for stroke prevention in patients with atrial fibrillation  
Chairs: J. Camm, UK and M. Brainin, Austria

Setting a new course: welcome and introduction  
J. Camm, UK

Signposts for stroke risk: how can we measure the burden of atrial fibrillation?  
G. Horiani, Italy

Exploring new territory: the significance of cryptogenic stroke  
D. Krieger, Denmark

Map reading master class: interpreting guidelines for stroke prevention in atrial fibrillation  
J. Camm, UK

Leading by example: a practical guide to dabigatran therapy  
H.-C. Diener, Germany

Asking for directions: Q&A session  
J. Camm, UK and M. Brainin, Austria

Moving forwards together: summary and close  
M. Brainin, Austria

Sponsored by Boehringer Ingelheim and Medtronic

12:45 - 14:15  Lunch Satellite Symposium Lundbeck  
Auditorium II

Management of acute ischaemic stroke: do we follow an evidence-based approach?  
Chair: A. Davalos, Spain

Introduction  
A. Davalos, Spain

Understanding the molecular basis of thrombolysis: theory and clinical applications  
D. Vivien, France

Endovascular treatment of acute ischaemic stroke: gathering the evidence  
A. Demchuk, Canada

Thrombolytic treatment of acute ischaemic stroke: extending the opportunities  
G.A. Ford, UK

Summary and close  
A. Davalos, Spain

Sponsored by Lundbeck

14:45 - 14:15  E-Poster Session Blue (p. 491) and Poster Session Blue (p. 540)  
Auditorium I

14:30 - 16:30  Joint Symposium ESO /ESC  
Auditorium I

ESO/ESC Joint Symposium  
Chairs: P. Michel, Switzerland and V. Caso, Italy

Controversy 1. Acute ischemic stroke : Arterial imaging is mandatory in the emergency setting  
Intro and first voting: P. Michel , Switzerland

Pro: O. Jansen, Germany  
Contra: M. Köhlemann, Germany

Second voting

Controversy 2. Acute carotid occlusions : Acute endovascular treatment should be performed  
Intro and first voting M. Mazighi, France

Pro: M. Paciaroni, Italy  
Contra: J. Punatsa, Finland

Second voting

Controversy 3. Spot-sign in intracerebral haemorrhage : Search it and treat it  
Intro and first voting K. Spengos, Greece

Pro : Th. Steiner, Germany  
Contra: C. Cordonnier, France

Second voting

E-Poster Session Blue: M. Futar, Germany; V. Himberg, Germany; J.P. Mohr, USA; K. Szabo, Germany

Poster Session Blue: R. Ackerman, USA; H. Bäzner, Germany; J. Belchekh, Hungary; A. Carolei, Italy; M. Correia, Portugal; V. di Piero, Italy; M. Fisher, USA; M. Giroud, France; A. Grau, Germany; T. Karapanayotides, Greece; J.S. Kim, South Korea; K.R. Lees, UK; A. Massaro, Brazil; B. Norrving, Sweden; T. Richards, UK; J. Saver, USA; C. Stam, The Netherlands, , D. Tanne, Israel
Background Clinical outcome in acute ischemic stroke (AIS) has been shown to be strongly correlated with revascularization in multiple studies, yet pharmacologic lysis of thrombus is often not successful or feasible in large vessel stroke. M767 was the first clot retrieval device cleared in 2004. Trevo® is a new, promising device which incorporates Stentrise® technology to engage and remove clot in AIS patients. The Trevo device has been registered to maximize thrombus integration to potentially provide an easier and more predictable method of thrombectomy. The device was initially evaluated in the TREVO study in Europe and reported encouraging results for both acute revascularization (91.7%) and 90-day clinical outcomes (mRS=0-2.55%, mortality=0%).

Methods TREVO 2 was a randomized, prospective, multi-center comparison of the Trevo and Merci devices in AIS caused by large vessel occlusions. Patients with angiographically confirmed persistent large vessel occlusion aged 18-79 with an NIHSS of 8-30 and symptom onset within 6 hours were included. Subjects who failed IV t-PA were eligible, but t-PA was prohibited. The trial utilized an independent imaging core lab. Clinical Events Committee (CEC), and Data Safety Monitoring Board (DSMB). The primary efficacy endpoint was revascularization success (TICI 2a or better, by core lab). The primary safety endpoint was a composite of serious procedure-related events.

Results Twenty seven sites in the US and Europe enrolled 172 subjects between February and December 2011. Follow-up is on-going so the results remain blind at the time of the abstract preparation. The pooled study cohort had a mean age of 67.2 and presented with a mean NIHSS of 18.1. The mean time from symptom onset to arterial puncture was 4.5 hrs. Late-breaking results, including demographics, procedural and 90d outcomes will be reported.

Conclusions This is the first randomized evaluation of the Trevo device, a promising new tool for treating AIS.

1 Acute stroke: new treatment concepts
14:30 - 14:40

Results from the TREVO 2 Study (Thrombectomy REvascularization of large Vessel Occlusions in acute ischemic stroke): Randomized data comparing Trevo with Merci for thrombectomy in acute stroke.


Department of Neurology, Goethe University, Frankfurt, GERMANY 1, Institute of Neuroradiology, Goethe University, Frankfurt, GERMANY 2

for the ENDOSTROKE Study Group

Objective We evaluated the safety and revascularization efficacy associated with various doses of intra-arterial thrombolytics.

Methods 164 consecutive patients who underwent emergent endovascular treatment over seven years at two comprehensive stroke centers were included. Univariate and multivariate analysis were performed to determine the dose response relationship between thrombolytic doses and outcomes. For standardization we used a conversion of newer thrombolytics to establish a standard dosage throughout cases (10mg alteplase = 2 Units of Reteplase = 6.3 Units of Tenectaplast). The rates of intracerebral hemorrhage (ICH) and favorable clinical outcomes (discharge modified Rankin score (mRS) = 0-2) were analyzed with various doses after adjusting for potential confounders.

Results Out of 290 patients who received endovascular treatment for acute stroke we studied 164 consecutive patients treated with intra-arterial thrombolysis from 2007 to 2011. age was 65±6.16; and there were 88 patients (53.6%) women and 78 (47.5%) who received both IV and IA therapy. IA thrombolytic dose was not different between the patients with and without ICH (mean: SD: 9.8±6.1 versus 9.8 ±5.9; p=0.39). We did not find any relation between increasing doses of IA thrombolytic and symptomatic or asymptomatic ICH. Adjusting for age, admission NIHSS score, IA thrombolytic dose and use of intravenous thrombolytics, dose of IA thrombolytic was not associated with intra-cerebral hemorrhage (odds ratio [OR] 1.02, 95% confidence interval [CI] 0.97-1.07, p=0.3919) or favorable outcome (OR, 1.01, 95% CI, 0.96-1.04, p=0.9568).

Conclusions: Our study demonstrates that IA rt-PA, or equivalent thrombolytic, in doses up to 69 mg is safe without any evidence of dose related adverse events presumably due to the short-half life of rt-PA.
15:40 - 15:50

Impact of thrombolytic treatment on early outcome after wake up stroke - data from the Austrian Stroke Unit Registry
R. Topolansky, L. Seyfang, F.T. Aichner
Department of Neurology, Hannover Medical School, Hannover, GERMANY

Background: On the optimal management and early outcome in patients with wake up stroke (WUS) are sparse. To date, the vast majority of patients with wake up stroke (WUS) are being excluded from thrombolytic treatment (TT). We evaluated the impact of TT on early outcome after WUS in patients captured in the Austrian Stroke Unit Registry.

Methods: WUS patients who received TT (n=107) and WUS patients without TT (n=321) were matched in a 1:3 ratio for age, sex, pre-stroke modified Rankin Scale score, and baseline National Institute of Health Stroke Scale (NIHSS) score. Only patients with baseline NIHSS 5-25 were included. Early outcome was assessed at the time of discharge from the stroke unit. Results: Vascular risk factors and stroke subtypes did not differ significantly between patients who received TT or those who did not. Magnetic resonance imaging was more often used as initial imaging modality in WUS patients who underwent TT compared to patients without TT (37.4% vs. 28.3%; p=0.01). Substantial early neurological improvement defined as a NIHSS score reduction of ≥24 points was significantly more frequent in patients with TT compared to patients without TT (57% vs. 41.7%; p=0.006). There were no significant differences in the rates of symptomatic intracerebral haemorrhage (5.3% vs. 5.1%; p=0.645) and death (1.9% vs. 3.7%; p=0.555). In the multivariate stepwise regression analysis on the whole WUS cohort (n=428), TT was identified as independent predictor of substantial early neurological improvement (OR 1.79, 95%CI 1.44-2.22, p=0.013).

Conclusion: Our data set – the largest published so far on the topic of TT in WUS patients – demonstrates that a large proportion of WUS patients benefit from TT without increase in major bleedings and death. TT independently predicted substantial early improvement. The stroke community needs further elucidation of safety and efficacy of TT after WUS.

5: Acute stroke: new treatment concepts
15:50 - 16:20

External Cerebrovascular Augmentations Blood Pressure and Cerebral Flow Velocities in Ischemic Stroke Patients with Cerebral Large Artery Occlusive Disease
W. Lin
Department of Medicine and Therapeutics, The Chinese University of Hong Kong, Sha Tin, HONG-KONG

Background: External counterpulsation (ECP) is a novel noninvasive method to improve the perfusion of vital organs, which may benefit ischemic stroke. We hypothesized that ECP may augment cerebral blood flow of ischemic stroke patients via induced hypotension.

Methods: We recruited 32 recent ischemic stroke patients with cerebral large artery occlusive disease (stroke onset < 7 days) and 20 healthy elderly controls into this study. Bilateral MCAs of subjects were monitored using transcranial Doppler (TCD). Flow velocity changes before, during and after ECP were respectively recorded for 5 minutes meanwhile continuous beat-to-beat blood pressure data were recorded. Cerebral augmentation index (CAI) was calculated by the increase percentage of cerebral blood flow velocity during ECP compared with baseline. TCD data was analyzed based on whether it was ipsilateral to the infarct side or contralateral side.

Results: ECP significantly increased mean blood pressure of stroke patients (12.34%) and controls (9.49%) compared with baseline, both p<0.05. During ECP, MCA mean flow velocities of stroke patients increased on ipsilateral side (5.55%) compared with controls (0.66%), both p<0.01, but there was no increase difference between the two sides when compared with each other. Mean flow velocities of controls did not change after ECP. After ECP, blood pressure and flow velocity of stroke patients all returned to baseline level.

Conclusion: ECP provides a new method of cerebral blood flow augmentation in ischemic stroke by elevation of blood pressure. Flow augmentation induced by ECP improves cerebral perfusion and collateral supply both from infarct ipsilateral and contralateral sides.
1 Epidemiology of stroke
14:30 - 14:40
Long-term risk and predictors of recurrent stroke beyond the acute phase. A Northern Sweden MONICA registry study 1995-2008
J. Pensions, M. Eriksson, B. Carlfors, P.G. Wiklund
Department of Public Health and Clinical Medicine, Umeå, SWEDEN, Department of Statistics, Umeå, SWEDEN, Department of Public Health and Clinical Medicine, Umeå, SWEDEN

Background - Despite declining stroke incidence in the industrialized world and major improvements in risk factor management, recurrent stroke is still an important clinical fact. A wide range of recurrence rates have been reported in previous studies, and only a few of these studies have been population-based. Our study set out to describe the risk and predictors of recurrent stroke (ischemic and haemorrhagic) in the Northern Sweden MONICA registry 1995-2008.

Methods - In the two Northern counties of Sweden, 7518 patients with an index ischemic stroke (IS) or an index intracerebral hemorrhage (ICH) were identified through the population-based MONICA stroke incidence registry. 6700 patients who survived the first 28 days were included. Kaplan Meier survival analyses and Cox proportional hazard models were carried out to identify predictors of stroke recurrence. Life table analyses were used to estimate the cumulative risk of recurrence. Results - The mean follow up time was 4 years. The overall rate of stroke recurrence from day 28 was 13.9%. The cumulative risk of stroke recurrence was at day 90, 2%, 6% in the first year, 17% at five years and 30% at 10 years. Statistically significant predictors for stroke recurrence were advanced age and diabetes mellitus. A secular trend towards lower risk of recurrence was identified. The linearity towards higher risk of recurrence after IS than after ICH was observed.

Conclusions - In this population-based study we show, in coherence with a recent meta-analysis, a declining risk of recurrent stroke. However, stroke recurrence is still a major clinical problem and further studies are needed to target risk groups. Diabetes and advanced age remain the significant predictors.

2 Epidemiology of stroke
14:40 - 14:50
The disparity between long-term survival after a first stroke in patients with and without diabetes persists 1985-2005: an analysis of 12,375 patients in the Northern Sweden MONICA Study
M. Eriksson, B. Carlfors, M. Eliasson
Department of public health, Umeå University, Umeå, SWEDEN, Department of public health and clinical medicine, Umeå university, Umeå, SWEDEN

Background - Diagnosis is an established risk-factor for cardiovascular disease and diabetic patients also have a worse outcome after an event. We analyzed how differences in long-term survival between diabetic and non-diabetic stroke patients have developed over time.

Methods - This study was based on 12,375 first ever stroke patients, 25-74 years old, in the Northern Sweden MONICA Stroke Registry 1985-2005. Primary endpoint was all cause mortality. Patients were separated into four cohorts according to year of stroke (1985-1989, 1990-1994, 1995-1999, and 2000-2005) and were followed until August 30, 2008, using the Cause of Death Registry.

Results - The diabetes prevalence at stroke onset was 21%, similar in men and women, and remained stable between 1985 and 2005. At stroke onset, diabetic patients were on average 2 years older and more often non-smokers. They were more likely to have antihypertensive treatment, atrial fibrillation, a history of myocardial infarction or TIA than non-diabetic patients. Median survival was 60 months (95% CI: 57-64) in diabetic patients compared to 117 months (113-120) in non-diabetic patients. The survival improved significantly in both groups (P=0.001). A multiple Cox regression, adjusting for possible confounders, showed a hazard ratio of 1.67 (1.58-1.76) surviving in diabetic and non-diabetic patients. Adding interactions to the model showed that the reduced survival in diabetic stroke patients was more pronounced in women (P=0.02) and younger patients (P<0.001). There was a tendency that the difference in survival decreased between the 2000-2005 cohort and previous cohorts, but the test for the diabetes-by-cohort interaction did not reach statistical significance (P=0.10).

Conclusions - Long-term survival after a first stroke has improved in both diabetic and non-diabetic patients. Survival is markedly lower in diabetic subjects, especially in women and younger patients, and the disparity persists over a 24-year observation time.

3 Epidemiology of stroke
14:50 - 15:00
YOUNGER AGE, SOCIOECONOMIC DISADVANTAGE, LOWER BODY MASS INDEX AND IRREGULAR VISITS TO A DOCTOR ARE ASSOCIATED WITH POOR MANAGEMENT OF RISK FACTORS AFTER STROKE
V. Droomanir, R.G. Evans, J. Kim, A.G. Thilag
Physiology Department, Monash University, Clayton, AUSTRALIA, Department of Medicine, Southern Clinical School, Monash University, Clayton, AUSTRALIA

Background - Many patients are poorly managed after stroke, and identifying factors associated with good and poor management may help target those for more intensive monitoring. We aimed to identify factors associated with better management of stroke risk factors.

Methods - Patients recruited to the population-based North-East Melbourne Stroke Incidence Study (NEMESS) were interviewed 10 years after stroke. At interview nurses carefully documented all medications prescribed to patients. In many instances medications were sighted. We also collected data on socioeconomic disadvantage and the regularity of visits to a general practitioner (GP). Body mass index (BMI) was calculated using self-report ed height and weight. Logistic regression was used to assess factors associated with antihypertensive medications, statins, and antithrombotic and anticoagulant agents.

Results - Of the total 1,592 patients with stroke (excluding subarachnoid hemorrhage) were recruited. Of the 771 patients alive 10 years after stroke, 552 of 771 patients (95.5%) were interviewed. Factors associated with prescription of antihypertensive agents at 10 years after stroke were age (OR 1.03, 95% CI 1.01-1.05, p<0.001), socio-economic advantage (OR 1.02, 95% CI 1.000-1.04, p<0.039), BMI (OR 1.10, 95% CI 1.03-1.16, p=0.002) and regular visits to a GP (OR 3.46, 95% CI 1.88-6.36, p<0.001). Among those with an ischaemic stroke, age and BMI were similarly associated with prescription of a statin, while age and manual occupation (OR 2.30, 95% CI 1.29-4.09, p=0.005) were associated with prescription of angiotensin antagonists.

Conclusions: Targeting younger, socioeconomically disadvantaged, thinner people who less often visit their GP via better education, or targeted recall to the clinic, may help improve risk factor management after stroke.

4 Epidemiology of stroke
15:00 - 15:10
A. Douri, A.G. Rudd, C.D.A. Wolfe
Division of Health and Social Care Research, NIHR-BRC Guy’s and St. Thomas’ NHS Foundation Trust, King’s College London, UNITED KINGDOM

Background - Estimates of time trends in the prevalence of cognitive impairment after stroke are necessary to develop more appropriate follow-up strategies and health policies. This study evaluates temporal change in the prevalence of post-stroke cognitive impairment stratified by sociodemography, vascular risk factors and stroke subtype.

Methods - Data were collected between 1995 and 2010 (n=4212) from the community-based South London Stroke Register covering an inner-city multi-ethnic source population of 271,817 inhabitants. Patients were assessed for cognition used the prevalence ratio (PR), as calculated by Poisson regression with robust SE.

Results - The overall prevalence of cognitive impairment 3 months after stroke and at annual follow up related unusually unchanged around 22%. A progressive trend of cognitive impairment rates was observed among patients with lacunar infarct and small vessels occlusion (SVO) (average annual percentage change (AAPC): 2% increase [95% CI 0.3-2.7] for lacunar infarct and 10% increase [7.9-12.8] for SVO up to 5 years after stroke). A similar trend was observed for patients with no pro-stroke vascular risk factor with an AAPC of 6% [5.3-7.5] in the first 5 years after stroke. In multivariate analyses, the post-stroke PR of cognitive impairment increased with older age (2% for each year of age), ethnicity (2-fold higher among Black) and socioeconomic (50% increased among manual workers).

Conclusions: Variations in post-stroke cognitive trends are predominantly explained by sociodemographic characteristics and stroke subtypes. Additional post-stroke surveillance and analytical studies are warranted in order for health systems to manage survivors with cognitive impairment.

5 Epidemiology of stroke
15:10 - 15:20
Carotid intima media thickness progression in individuals fails to predict the risk of clinical vascular events in the general population — results from the PROG—IMT collaborative project
M. Lorentz
un on behalf of the PROG-IMT study group
Dept. Of Neurology, University Frankfurt, Frankfurt, GERMANY

Background - It is well established that a single measurement of carotid intima media thickness (cIMT) is related to the risk of cardiovascular events in the general population. The association between cIMT progression and cardiovascular risk is frequently assumed but has rarely been reported.

Methods - We identified general population studies that assessed cIMT at least twice and followed participants for myocardial infarction (MI), stroke, or mortality. The study teams collaboratively in an individual participant data meta-analysis. Excluding subjects with previous MI or stroke, the association between cIMT progression and the risk of cardiovascular events was assessed for each study using Cox regression. The log hazard ratios per stan-
Epidemiology of stroke
15:20 - 16:30

Gender difference in the effect of living standard on 3-year stroke fatality – the Budapest District 8-12 Project
D. Bereczki1, A. Ajtay1, A. Majernik2, Zs. Daníos3, L. Lentz3, K. Erdély4, L.K. Koves4, B. Cundis3, Zs. Laki4, A. Kéri1, I. Vastagh1, A. Folyovich4
1 Department of Neurology, Semmelweis University, Budapest, HUNGARY
2 Department of Neurology and Stroke Center, Szent János Hospital, Budapest, HUNGARY

Background: epidemiological studies found that at the country level, older age groups showed the greatest contribution to stroke mortality.

Methods: The South London Stroke Register identified 1143 strokes from 2005-2007 and recorded the SIS at 3, 6 and 12 months post stroke. The impact of sociodemographic (age, gender, ethnicity, socioeconomic status, education level) and clinical (stroke subtype and severity, stroke unit care and pre-stroke disability) characteristics may not fully capture the impact stroke has on survivors’ lives. The Stroke Impact Scale (SIS) assesses health related quality of life (HRQOL) across 5 domains (physical, communication, emotion, memory/thinking and participation). This study identifies predictors of HRQOL after stroke in an unbiased sample from a population based register.

Methods: The South London Stroke Register identified 1143 strokes from 2005-7 and recorded the SIS at 3, 6 and 12 months post stroke. The impact of sociodemographic (age, gender, ethnicity, socioeconomic status, education level) and clinical (stroke subtype and severity, stroke unit care and pre-stroke disability) characteristics may not fully capture the impact stroke has on survivors’ lives. The Stroke Impact Scale (SIS) assesses health related quality of life (HRQOL) across 5 domains (physical, communication, emotion, memory/thinking and participation). This study identifies predictors of HRQOL after stroke in an unbiased sample from a population based register.

Results: of the 843 patients having a discharge diagnosis of cerebrovascular disease, 438 had acute stroke (227 in D-8 and 211 in D-12). Three-year case fatality was 36% in D-8 and 31% in D-12 (p=0.24). Of the fatal cases men were more than 12 years older in the younger district (69±13±2 vs. 82±19±2 years in D-8 and D-12, p=0.001). Whereas in the poor district men died 6 years younger than women (69.7±13.2 vs. 75.5±12.4 years), in the wealthier district there was no difference in age between genders for those who died by 3 years after stroke (82±6±2 and 82±17±5 years for men and women, respectively). Conclusion: living standard has a strong effect on the age of stroke deaths in both genders. The effect of poverty is more pronounced in men. The gender difference in age at stroke death can be detected in the poor but not in the wealthy living environment. In national stroke programs primary prevention should focus especially on male populations of less wealthy regions.
Fatigue is associated with reduced physical activity one month after stroke

F. Duncan, G.E. Mead, M. Dennis, C. Geyer, S. Lewis
University of Edinburgh, Edinburgh, UNITED KINGDOM

Background: Fatigue is a common and distressing symptom after stroke. One important hypothesis is that post-stroke fatigue might be triggered by physical de-conditioning which is caused by reduced physical activity. Determining whether there is an association between fatigue and reduced activity would help to justify the development of an exercise-based intervention for post-stroke fatigue.

Methods: Participants were recruited from acute stroke units, rehabilitation hospitals and an outpatient clinic to a longitudinal cohort study. One month after stroke onset they completed the Fatigue Assessment Scale (FAS) and a fatigue case definition interview. They also wore an ActiP:ALM accelerometer on their thigh for 7 days which directly measures time spent sitting/lying, standing, stepping and the number of steps taken per day.

Results: The fatigue assessments were completed by 132 participants and ActiP:ALM data for 84 participants were collected. Participants spent a median of 20.15 hours (IQR 3.68) sitting or lying down per day, 3.02 (IQR 3.15) hours spending time stepping and took 2756.8 (IQR 4380.9) steps per day. A Spearman’s correlation revealed higher fatigue assessment scores (indicating more fatigue) were associated with less time standing (r = -0.316, p<0.01), less time stepping (r = -0.378, p<0.01), a fewer number of steps taken per day (r = -0.375, p<0.01) and with more time spent sitting and lying down (r = -0.342, p<0.01). Those fulfilling the case definition for fatigue took significantly fewer steps per day (5018.97, SD 2996.71) than those not fulfilling the case definition (4183.68, SD 3493.87) (Mann-Whitney U = 551.000, p<0.05, one tailed).

Conclusion: Higher fatigue scores are associated with lower levels of physical activity. These preliminary data provide some support for the developing of an exercise-based intervention for post-stroke fatigue.

3 Rehabilitation and reorganisation after stroke B
14:30 - 14:40
Can treadmill training improve walking in the chronic phase of stroke? The AMBULATE Randomised Controlled Trial
R.I. Lindley, C. Dean, L. Ada
Macquarie University, Sydney, AUSTRALIA

Background: Walking is one of the most important functional activities to enable independence. We tested the hypothesis that treadmill training could lead to sustained improvements in walking speed for stroke survivors who were slow walkers.

Methods: We performed a randomised controlled trial with randomisation stratified by baseline walking speed. Patients were allocated to control (baseline and outcome assessments only), or 2 month, or 4 month period of treadmill and overground walking training. Training occurred three times a week. Transport was provided. Our primary outcome measure was the 6 Minute Walk Test (6MWT). Other outcomes included walking speed and step length.

Results: 102 patients were recruited at a mean of 21 months after stroke, with a mean walking speed of 0.50 m/s. Treadmill training improved 6MWT distance, walking speed and step length during actual training, with significant differences seen for the 4-month training group versus 2-month control and measured at 4 months. The 6MWT between-group mean difference was 38 m (95% CI 15-60) for the 4-month group versus control and 29 m (95% CI 4-53) for the 4-month versus 2-month control group. Increases in walking speed and cadence were only significant for the 4-month group, who at four months walked 0.12 m/s (95% CI 0.04-0.20) faster and 6 more steps per minute (95% CI 1.12-12) than control. Performance declined in both training groups after cessation of training, with no significant differences between training groups and control at 12 months.

Conclusions: Sustained treadmill training can improve walking distance, speed and cadence for people in the chronic phase of stroke but these benefits decline once training ceases. This suggests that training needs to be sustained to obtain maximal abilities after stroke. Current rehabilitation services are not designed for continued training and our results suggest that sustainable community programs need to be developed.

4 Rehabilitation and reorganisation after stroke B
14:50 - 15:00
Resting-state functional MRI in stroke patients (1): from functional connectivity to functional outcome
F. Barousse-Chauvet1, G. Varoquaux2, M. Gaudron3, C. Roux4, A. Kleinschmidt2, Y. Samson1
1AP-HP, Urgences Créatifs-Val de Marne, Hôpital Pitié-Salpêtrière & INSERM U992, Laboratoire de Neuro-imagerie Cognitive, Neurospin, CEA, PARIS, FRANCE
2INSERM U992, Laboratoire de Neuroimagerie Cognitive, CEA, Neurospin, G. Varoquaux, Y. Samson, France
3Centre de NeuroImagerie de Recherche - CENIR, Centre de Recherche - UPMC, Paris, France
4Centre de Recherche - UPMC, Paris, France

Background: Resurgence of interest in resting-state functional MRI (rs-fMRI) is used to study functional connectivity (FC) in the so-called resting-state cortical networks (RSN), which may be altered in stroke patients. Previous studies focused on specific alterations or in specific patient populations.

Methods: Patients were recruited from the AMBULATE RCT; a randomised controlled trial of treadmill training in the chronic phase of stroke. Training occurred three times a week. Resting-state fmri was performed on a 3T scanner at baseline and 2 months post-stroke. Functional connectivity (FC) was calculated using the FSL software and correlated with clinical outcome.

Results: Significant network and group effects were found and network*group interaction (p<0.0001). Post-hoc analyses showed that FC abnormalities occurred in 6 of the 7 networks (p<0.0001) and the non-disabled group (p<0.001) and the disabled group (p<0.01) were more severely affected in the same set of networks. The 4-month group versus control, the 6MWT between-group mean difference was 38 m (95% CI 15-60) for the 4-month group versus control and 29 m (95% CI 4-53) for the 4-month versus 2-month control group. Increases in walking speed and cadence were only significant for the 4-month group, who at four months walked 0.12 m/s (95% CI 0.04-0.20) faster and 6 more steps per minute (95% CI 1.12-12) than control. Performance declined in both training groups after cessation of training, with no significant differences between training groups and control at 12 months.

Conclusions: Sustained treadmill training can improve walking distance, speed and cadence for people in the chronic phase of stroke but these benefits decline once training ceases. This suggests that training needs to be sustained to obtain maximal abilities after stroke. Current rehabilitation services are not designed for continued training and our results suggest that sustainable community programs need to be developed.
5 Rehabilitation and reorganisation after stroke B
15:38 - 15:48
Resting-state functional MRI in stroke patients (2): from local structural lesion to widespread dysfunction
F. Baronnet-Chauvet1, G. Varoquaux2, Y. Samson1, A. Kleinschmidt1

ABSTRACT: UGGroup Clérino-Villejuif, Hôpital Pitié Salpêtrière & INSERM U902, Laboratoire de Neuroimagerie Cognitive, Neurospin, CEA, PARIS, FRANCE; INSERM U902, Laboratoire de Neuroimagerie Cognitive, CEA, Neurospin, Gipsy Yvette, FRANCE; COGIMAGE, Centre de Recherche de l’Institut du Cerveau et de la Moelle épinière, UPMC Paris 6, Inserm, U937, CNRS, UMR 7225, Paris, FRANCE; Centre de Neuroimagerie de Recherche - CENIR, Centre de Recherche de l’Institut du Cerveau et de la Moelle épinière, UPMC, Paris, FRANCE

Background: In the companion abstract, we report a decrease in functional connectivity (FC), as measured by resting-state MRI (rs-MRI), in stroke patients with residual disability but not in patients who recover without disability. These abnormalities were observed in 6 out 7 large bilateral resting-state cortical resting-state networks (RSN).

Here, we distinguish 3 types of FC: inter-hemispheric from homologous regions (homo-FC) and intra-hemispheric in the ipsi-lesional (ipsi-FC) and contra-lesional (contra-FC) hemisphere.

Methods: rs-MRI was performed in 51 first-ever patients (29 males, 22 left strokes, 57 ± 1.4 years) 8 ± 7 weeks post stroke onset and in 75 normal subjects (27 males, 55 ± 15 years). Patients were sorted in non-disabled (mRS 0-1) and disabled groups (mRS > 1, n=28).

A seed-based analysis was used to identify 7 RSN (default mode, motor, visual, language, salience, fronto-parietal ventral and dorsal attentional networks). We compared the 3 FC types (homo-FC, ipsi-FC and contra-FC) in the 3 groups (disabled, non-disabled, and control) using repeated measures ANOVA.

Results: The FC type and group effects and the FC type*group interaction were significant (p<0.0001). As in the companion abstract, Post-hoc analyses showed that significant FC decreases only occurred in the disabled group who had a lower FC than the two others (p<0.0001), and that the interaction was explained by a larger decrease in homo-FC and ipsi-FC (p<0.0003) than in contra-FC, which remained nevertheless significant (p<0.006).

Conclusion: Resting-state FC is preserved in non-disabled stroke patients.

In disabled stroke patients, the FC alterations predominately inter-hemispheric homologous and ipsi-lesional intra-hemispheric connections but extend at a lesser degree to the contra-lesional intra-hemispheric connections, reflecting an indirect mechanism (diaschisis) beyond necrosis and disconnection.

6 Rehabilitation and reorganisation after stroke B
15:28 - 15:38
Early supported discharge in its natural habitat: a case control study.
F. de Peretti, D. W. Stott
Academic Section of Geriatric Medicine, Glasgow Royal Infirmary, Glasgow, UNITED KINGDOM; Academic Section of Geriatric Medicine, Glasgow Royal Infirmary, Glasgow, UNITED KINGDOM

Background: Clinical trials of early supported discharge (ESD) services have shown a reduction in long-term dependency, institutionalization and length of hospital stay for a selected group of stroke survivors. However, it is unclear if these gains can be realised in routine clinical practice.

Methods: We performed a retrospective case control analysis of consecutive acute stroke presentations from one defined population prior to (August 2000 – July 2002) and after (August 2007 – July 2010) the establishment of an ESD service. Each patient receiving ESD input was matched with one historical and one contemporary control for age, sex, pre-stroke dependency, baseline stroke severity (Modified Rankin Score (mRS)) and Oxfordshire Community Stroke Project classification. The primary outcome was living at home within 30 days of presentation.

Results: In total 123 patients accessed the ESD service. Matching was complete (246 controls) on all predefined variables; a small number (8/123 cases and controls) initially accessed the service as an outpatient. There were no significant differences in baseline characteristics. Patients in the ESD group were more likely to be living at home within 30 days (78.7%) than both historical and contemporary controls (64.2% and 57.4% respectively; p = 0.001) and had a shorter mean length of hospital stay (23.6 days; 27.2 days; 34.3 days respectively). Compared with the combined control groups, ESD length of stay was reduced by 6.9 (0-13.8; p=0.05) days and the odds ratio for living at home by day 30 was 2.37 (95% confidence interval 1.34 to 3.53; p<0.001). Biomass logistic regression adjusting for differences in dependency at discharge with dichotomized mRS (0-2 independent; 3-5 dependent) did not significantly alter this effect.

Conclusion: Implementation of stroke ESD services in routine clinical practice appears to achieve similar outcomes to those seen in randomised control trials.

7 Rehabilitation and reorganisation after stroke B
15:38 - 15:48
SECONDARY GOAL ATTAINMENT IN PATIENTS WITH POST-STROKE SPASTICITY (PSS) OF THE HAND AND WRIST: FINDINGS FROM THE BOTOKIÉ ECONOMIC SPASTICITY TRIAL (BEST)
S. Sharma1, J. Wisniewski1, A. Ward1, J. Borg1, A. Fullard-Smith1

BEST study group

SUMMARY: Northwestern University Feinberg School of Medicine; The Rehabilitation Institute of Chicago, Chicago, USA; The Rehabilitation Institute of Chicago, Chicago, USA; NextGen Ltd, Helsinki, FINLAND; University of Auckland, Department of Sport and Exercise Science, Auckland, NEW ZEALAND

Background: Goal attainment scaling is a valuable tool in PSS rehabilitation.

Methods: Adults with focal PSS (BoNT-A naive and with some preserved function in the limb to be treated) were randomised to BoNT-A + standard care (SC) or placebo + SC for up to 2 treatment cycles. Between 24 and 52 weeks, all patients were permitted to receive open-label BoNT-A injections. The primary outcome measure was the investigator-assessed percentage of patients achieving their primary active functional goal at Week 24/10 weeks post second injection. Secondary goals (active or passive) were also set for each patient. A prospectively planned subgroup analysis evaluated BoNT-A vs placebo in patients with hand/wrist spasticity.

Results: 153 patients were included in the hand/wrist spasticity subgroup (59% male, mean age 62 years; median time since stroke 20 months [range 3-232]). Secondary active functional goals (N=67) were achieved at 12 weeks by 54.5% of patients receiving BoNT-A + SC vs 28.6% of patients receiving placebo + SC. At Week 24/10 weeks post second injection, these percentages were 38.7% for BoNT-A + SC vs 48.4% for placebo + SC (odds ratio [OR] 0.73; 95% confidence interval [CI] 0.49-1.12). At 152 weeks, secondary active functional goals were achieved by 43.8% of patients in the BoNT-A + SC group vs 41.2% of patients in the placebo + SC group. Secondary passive goals (N=72) were achieved at 12 weeks by 48.6% of patients receiving BoNT-A + SC vs 33.5% of patients receiving placebo + SC. At Week 24/10 weeks post second injection, these percentages were 60.0% for BoNT-A + SC vs 29.4% for placebo + SC (OR 3.60; 95%CI 1.36-9.51). At 52 weeks, secondary passive goals were achieved by 62.8% of patients in the BoNT-A + SC group vs 57.6% of patients in the placebo + SC group.

Conclusion: The addition of BoNT-A 240U to SC significantly increases the proportion of patients with hand/wrist spasticity achieving their passive goals.

8 Rehabilitation and reorganisation after stroke B
15:48 - 15:58
The Contrastive Stroke Study: Improving Hand and Arm Function After Stroke with Combined Non-Invasive Brain Stimulation and Task-Oriented Therapy – Preliminary Findings
R.L. Harvey1, H.R. Roth2, R.S. Tapour3, R. Kemen4, J. Laine5, J.W. Stinear6, L.M. Rogers7

Northwestern University Feinberg School of Medicine; The Rehabilitation Institute of Chicago, Chicago, USA; The Rehabilitation Institute of Chicago, Chicago, USA; NextGen Ltd, Helsinki, FINLAND; University of Auckland, Department of Sport and Exercise Science, Auckland, NEW ZEALAND

Background: Following stroke, diminished drive from the lesioned hemisphere exacerbated by inhibition from the non-lesioned hemisphere (NHL) can result in unilateral paresis. One strategy to improve paretic limb function is to reduce inhibition from the NHL with low frequency transcranial magnetic stimulation (e.g., 1Hz rTMS). The present study examines whether neuro-navigated 1Hz rTMS targeted to the NLH combined with task-oriented occupational therapy (OT) is superior to therapy alone for improving arm and hand function.

Methods: 15 patients (3-9 months post-stroke) were randomly assigned to sham (n=5) or active 1Hz rTMS (n=10) targeted to the wrist extensor representation in the NLH. Patients completed 3 visits per week for 6 weeks that included: 20min pre-functional OT, neuro-navigated 1Hz rTMS or sham, and 40min upper-limb task-oriented OT. Patients returned for 1 week, 1 month, and 6 month follow-up visits. At baseline the groups had similar impairment scores as assessed with the Upper Extremity Fugl Meyer Scale (UEFM) (20.8±1.1 vs. active, 21.8±1.7; sham; p=0.16).

Results: Patients receiving active rTMS prior to task-oriented OT made significantly greater gains on the UEFM by 6 months post-intervention than patients receiving sham stimulation (change in UEFM 13.2 ± 10.8 vs. 2.0 ± 5.2; p<0.05) (fig. 1). Individuals receiving active rTMS were significantly more likely to exceed the published minimal clinical important difference (MCID) on the UEFM at 6 months post (80% vs. 20%; p = 0.024)(fig. 2). Similar trends at 1 week and 1 month post were not statistically significant.

Conclusion: These findings suggest neuro-navigated 1Hz rTMS paired with task-oriented OT is more likely to promote clinically important improvements than OT alone. Of note is the finding that significant improvements in impairment were seen 6 months following therapy, suggesting non-invasive brain stimulation as an adjuvant to therapy promotes lasting neuroplastic change.

Fig 1. UEFM change scores across follow-up visits. Thick black line indicates the MCID in the UEFM. Asterisk denotes significant difference between groups

Fig 2. Individuals per group at or exceeding the MCID in UEFM. Asterisk denotes significant difference between groups.
Dual-hemisphere tDCS in chronic stroke patients improves “simple” precision grip and digital dexterity of the paretic hand with a delayed time-course

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Y. Vandermeeren\(^1\), P. Laloux\(^1\), J. Jamart\(^2\), A. Peeters\(^1\), J.-L. Thonnard\(^3\), S. Lefebvre\(^1\)

Background: Rebalancing inter-hemispheric interactions is an appealing therapeutic option to improve motor recovery after stroke. Anodal/cathodal transcusional direct current stimulation (tDCS) separately demonstrated their aptitude to rebalance inter-hemispheric interactions and improve motor function. We explored whether dual-hemisphere tDCS (dual-tDCS) improved performance in “basic” (precision grip) and more complex (digital dexterity) motor tasks in chronic stroke patients.

Methods: Motor performances of 19 chronic hemiparetic stroke patients were quantified over two sessions, one week apart. During each session, patients performed 10 grip-lift movements with a manipulandum, and Pursue Pegboard Test (PPT: digital dexterity) before, during, after and 20 min after dual-tDCS (20 min, 1 mA) applied simultaneously over the ipsilesional (anodal) and contralateral (cathodal) primary motor cortices. The study assumed a double-blind (sham/real), randomised and balanced design.

Results: Motor performances of the paretic hand were significantly improved after real dual-tDCS when compared to sham dual-tDCS. Several grip-lift parameters were improved only after real dual-tDCS (e.g. ratio grip force/ load force: -8%, preloading phase duration: -18%). On PPT, a 38% improvement was observed after real dual-tDCS, compared to 5% after sham (RM-ANOVA p=0.001). The improvements on PPT correlated negatively with ABILHAND scores (r=-0.54; p=0.03), suggesting that dual-tDCS improved more the patients with lower residual hand function. Strikingly, the maximal improvements were observed 20 min after the end of stimulation.

Conclusion: Dual-tDCS improved performances in chronic stroke patients on a “basic” motor task (precision grip) but had a greater impact on a more complex task (PPT); the benefit was stronger in the most impaired patients. The maximal improvements were delayed after the end of stimulation. Dual-tDCS may become an important add-on therapy in neurorehabilitation.
Considerable variation in clinical practice intravenous thrombolysis in stroke patients in the Netherlands.


VU Medical Centre, department of Neurology, Amsterdam, THE NETHERLANDS

Background: In the Netherlands in 2010 3428 intravenous thrombolyses (IVT) were reported. The percentage of ischemic stroke patients receiving IVT in different hospitals ranged from 4.7 to 40%. This may be due to referral pattern, but can also be the result of variation in clinical practice. Also the percentage of patients with a door to needle time (DTNT) less than an hour ranged from 34.48 to 100%. In this study we looked for this variation and possible effects on performance.

Methods: In all 84 Dutch hospitals performing IVT a stroke neurologist was approached using a web-based survey. The survey consists of questions on stroke performance (e.g. DTNT) and questions about clinical cases. Results: Response rate was 82%. The reported average DTNT ranged from 29 to 80 minutes, (median values 25 to 61). A linear regression analysis did not show a relationship between number of stroke patients receiving IVT and DTNT.

Acute stroke: current treatment

16:45 - 16:50

Reperfusion therapy for stroke in Catalonia. Data from a population-based register

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on behalf of the Catalan Stroke Code and Reperfusion Group (Cat-SCR)

Stroke Programme. Department of Health, Generalitat de Catalunya, Barcelona, SPAIN1, H. Universitari Germans Trias i Pujol, Badalona, SPAIN2, H. Clínic i Provincial, Barcelona, SPAIN3, H. Universitari Vall d’Hebron, Barcelona, SPAIN4

Background: Because delivery of reperfusion therapies is time-dependent, development of organized systems of stroke care is crucial as is the involvement of the health administration. In Catalonia (Spain, 7.5 M inhabitants), there exists a universal Stroke Code system with clearly defined primary and comprehensive stroke centres that serve the whole territory. Since January 2011, all patients treated with any reperfusion modality are declared to a population-, web-based register with prospective, mandatory inclusion and external monitoring (comprehensiveness and accuracy). Objective: to describe the rate and clinical outcomes of reperfusion therapies for stroke in Catalonia along 2011.

Methods: Data collected included demographics, pre-stroke independence, comorbidity, stroke severity (National Institute of Health Stroke Scale, NIHSS), treatment modality and onset-to-treatment time (OTT). Outcome measures: symptomatic intracerebral haemorrhage (SICH) at 24-36 hours, mortality and modified Rankin Scale (mRS) at 1 month.

Results: We analyse 1007 patients: 736 (73%) received intravenous rtPA (IVT) and 271 (27%) endovascular treatment (EVT), in 152 cases after IVT. The overall reperfusion treatment rate was 12%. Baseline characteristics were slightly different between groups: patients treated with IVT were older (71 vs. 68 years), had milder strokes (NIHSS score 10 vs. 17) and shorter OTT (145 vs. 295 minutes). SICH rates were 8% for IVT and 6% for EVT. Among EVT patients, the rate of successful recanalisation (Thrombolysis in Cerebral Infarction score 2b or 3) was 72%. Among patients who had complied the 3-month follow-up, mortality and functional independence (mRS 0-2) were 17.6% and 52% in the IVT group, and 24.8% and 64% in the EVT group.

Conclusions: Implementation of a health administration-based register facilitates high rates of reperfusion therapies and a prospective, individualised surveillance of effectiveness.

4 Acute stroke: current treatment

17:08 - 17:10

Is there a delay in IV thrombolysis in acute stroke after the extension of the time window?

G. Reig, A. Ximénez-Carrillo, G. Zapata-Waiberg2, M. Alonso de Lezclana1, B. Fuentez1, A. García-Pantoz, A. García-García2, G. Ruiz-Ace3, F. Díaz-Otto, P. Simau1, J. Marjau1, E. Díez-Tejedor2, A. Gif, J. Egido1, J. Vivanco3

MADRID STROKE NETWORK., Madrid, SPAIN


BACKGROUND: ECASS3 proved that it is safe and effective to treat ischemic stroke patients with IV tPA within a 4.5 hours time window. It has been suggested that extending the time window could affect treatment procrastination. With this study we aimed to find whether the time-window extension had caused a delay in acute stroke treatment in 5 Stroke Units of the Region of Madrid.

METHODS: We performed a retrospective observational study based on the multicenter prospective stroke registry of Madrid (MADRISTROKE Network). The primary objective of this study was to compare the in-hospital times: door-to-image (DTI) and door-to-needle (DTN) times, in patients treated with IV alteplase before (TB group) and after (TA group) the publication of the ECASS3 trial (October 2008). Secondary objectives were to compare 3 months independence and complication rates.

RESULTS: TA group = 474; TB group = 720. TA patients were older (69.8 ± 14.5 vs 67.6 ± 13.5 years, p = 0.01) and with lower baseline NIHSS (median [IQR]: 12 [7-18] vs 13 [9-18] points; p<0.001). There were significantly more diabetic patients and fewer active smokers in the TA group, the remaining of vascular risk factors were distributed similarly between both groups. Median DTN time was 55 minutes (IQR = 40-72) in the TA group and 57 minutes (IQR=45-73) in the TB group. Median DTI time was 20 minutes (IQR = 11-29) in the TA group and 22 minutes (IQR = 13-24) in the TB group. These differences were statistically significant.

CONCLUSIONS: Expanding the time window for intravenous thrombolysis has not produced a delay in DTN and DTI, even these times were significantly reduced. There were no significant differences in complications or patients evolution (independence and mortality at 3 months) in 5 Stroke Units of the Region of Madrid.

5 Acute stroke: current treatment

17:38 - 17:40

Systemic thrombolysis in cancer patients – is it safe and effective?

C.J. Schwarzhäus, A. Schuier, M.G. Hennencr, M. Fatir

Department of Neurology, UniversityMedizin Mannheim, University of Heidelberg, Mannheim, GERMANY

BACKGROUND: The use of systemic thrombolysis in cancer patients is of growing importance and has been debated controversially, mainly because of insufficient data about the benefit-risk-ratio of t-PA therapy in patients with malignat cancer.

METHODS: We identified 140 sequentially admitted patients with acute ischemic stroke and the additional diagnosis of malignant cancer vs. an age- and gender-matched control group treated in our stroke unit. Clinical outcome, risk of bleeding complications and mortality were compared between both groups.

RESULTS: 18/140 cancer and 27/140 non-cancer patients underwent systemic thrombolysis with similar inclusion/exclusion criteria irrespective of the malignant coexisting disease. Thus time between onset of symptoms and beginning of therapy as well as prevalence of additional risk factors except cancer did not differ significantly between the two groups (p = 0.41 & p = 0.12). Cancer and non-cancer patients improved equally after thrombolysis measured by NIHSS, mRS and Barthel scale after 24h and 72h as well as time of dismissal. Rate of intracranial hemorrhage and thrombolysis-associated complications did not differ between both groups (p=0.22 & p=0.50).

In-hospital-mortality after 14 days was higher in cancer patients (3/18(16.7%) vs. 1/27(7.4%), but the difference was not significant (p=0.29). There was no associated with bleeding complications in a single cancer patient and mortality was elevated in cancer patients irrespective of thrombolysis (14/140(10%) vs. 6/140(4%)).

CONCLUSION: Our data suggests that systemic thrombolysis in cancer patients is as safe and effective as in non-cancer patients with an equal distribution of thrombolysis-associated complications between the two groups. To the best of our knowledge this is the largest study so far evaluating the risk and effectiveness of t-PA treatment in cancer patients. Still, numbers are too small to pass judgment on the elevated mortality among cancer patients.
6 Acute stroke: current treatment
17:36 - 17:46

Impact of Atrial Fibrillation on Outcome in Thrombolysed Stroke Patients: Evidence from the Virtual International Stroke Trials Archive (VISTA)
Department of Neurology, University of Duisburg-Essen, Essen, GERMANY; Department of Medicine and Therapeutics, Faculty of Medicine, University of Glasgow, Western Infirmary, Glasgow, UNITED KINGDOM; Stroke Research Unit, Faculty of Medicine and Dentistry, University of Alberta, UNITED KINGDOM

Background: Atrial fibrillation (AF) has been considered a risk factor for poor outcome from acute stroke and may influence response to thrombolysis, though supporting data are limited due to potential confounding with age and stroke severity, as well as small sample size.

Methods: We compared the distribution of AF and thrombolysis exposure with the modified Rankin scale (mRS) score distribution at 90 days, among patients registered in the Virtual International Stroke Trials Archive (VISTA). We used an age and baseline NIHSS adjusted Cochran-Mantel-Haenszel test to test significance (p) followed by proportional odds logistic regression analysis to estimate the odds ratios (OR) for improved mRS score. The significance of the interaction between AF, age and thrombolysis on mRS at day 90 was investigated. A plot of the effect of thrombolysis in AF patients on full scale mRS day 90 against age was constructed to investigate the interactions with treatment and age among AF patients.

Results: Data were available for 7091 patients (1631 AF), of whom 3027 were thrombolysed (639 with AF). Patients with AF were in average 7.5 years older and had a 2 point higher baseline NIHSS. An association of treatment with outcome was seen independently and was of similar magnitude within patients with AF (OR 1.44, 95% CI 1.12-1.81, p<0.001) and without AF (OR 1.53, 95% CI 1.39-1.69, p<0.001). No association of AF and overall stroke outcome could be found (OR 0.93, 95% CI 0.84-1.03, p=0.49).

Discussion: No interaction between alteplase treatment and age on outcome among AF patients (p=0.671).

Conclusion: In this nonrandomised comparison presence of AF had no independent impact on stroke outcome, and compared to untreated comparators the patients who received thrombolysis experienced an advantage in outcomes that was of equal magnitude whether in presence or absence of AF.

7 Acute stroke: current treatment
17:38 - 17:40

Stroke of unknown time of onset: Is Image-based selection for IV reperfusion therapy safe and effective?
East Kent University Hospital NHS Foundation Trust, Ashford, UNITED KINGDOM

Background: Stroke of unknown time of onset (SUTO) is common. Patients with SUTO are currently not routinely recommended for Intravenous thrombolysis. Methods: We retrospectively compared data before and after the introduction of Image-based selection of patients with SUTO for IV reperfusion therapy. Data held in our stroke registry includes on age, sex, baseline and 24-hour NIHSS, baseline and discharge mRS, in-hospital mortality, discharge destinations and length of hospital stay. Patients not treated with IV Alteplase (<51) were in the current guideline, termed “Do no harm” (DH) group (1st August 2009- 31 July 2010), patients treated (≥55) with the aid of multimodal CT, including CT perfusion were in the Image-based (IB) group. We analysed outcome data, and for adjusted for age, sex, previous stroke, diabetes mellitus, hypertension, atrial fibrillation, reduction in NIHSS, mRS, and baseline NIHSS. The reduction in NIHSS, reduction in mRS and length of stay was measured on a continuous scale, with linear regression model used in the analyses. A log transformation analysis was performed upon length of stay data.

Results: There was a statistically significant difference between the two groups for all outcomes examined. The difference was statistically significant in the adjusted and unadjusted comparisons. After adjusting for confounding factors, the reduction in NIHSS and mRS was >7 (p<0.001) and >1.5 (p<0.001) in the IB group. The odds of death was 10 times lower in the IB group (p=0.02) than in the DH group. The length of stay was also 50% lower in the IB group, after adjusting for confounding factors (p=0.04). The odds of being discharged home were 11 times greater in IB (p<0.001) than DH group.

Conclusions: Image-based (IB) patient selection for IV thrombolysis appeared safe and effective for patients with Stroke of unknown time of onset (SUTO) in our centre. Outcomes in this group appeared superior to the published data in on-licence use of IV thrombolysis. Enrollment of this patient group in a randomised controlled trial is required to validate and confirm this approach in routine clinical practice.

8 Acute stroke: current treatment
17:40 - 17:46

Does advanced age influence the effect of intra-arterial treatment for acute ischaemic stroke?
Department Neurology, School for Cardiovascular Disease (CARIM), Maastricht University Medical Centre, Maastricht, The Netherlands, Rotterdam, THE NETHERLANDS; Department of Neurology. Erasmus Medical Centre, Rotterdam, THE NETHERLANDS; Department of Radiology MC Haaglanden, The Hague, THE NETHERLANDS; Department of Radiology, Leiden University Medical Center, Leiden; THE NETHERLANDS; Department of Radiology. Erasmus Medical Center, Rotterdam, THE NETHERLANDS

Introduction: Older adults with acute ischaemic stroke (AIS) may benefit less from intra-arterial treatment (IAT). Because of advanced atherosclerosis, older patients more often have elongated and stenotic blood vessels and they may be more vulnerable to complications. We studied the association of age with the duration of treatment, recanalization, complications and functional outcome in patients with AIS.

Methods: We gathered data from patients treated between 2002 and 2011. Thirteen hospitals in the Netherlands participated. Recanalization was defined as a thrombolysis in cerebral infarction (TICI) score of 2b or 3. Good functional outcome was defined as a modified Rankin score of 2 or less at discharge. The association between age and outcome was assessed with multivariable regression analysis. We adjusted for gender, occlusion site, stroke severity and experience of the intervener. Results were expressed as adjusted odds ratios per year of age (aOR) with 95% confidence intervals (CI).

Results: Of the 308 patients included patients the mean age was 60 years. Twenty-five percent of the patients were older than 72, and 10% were older than 78. Mean NIHSS was 16. Intracranial carotid occlusions were not observed in patients aged over 70. Ager was not associated with duration of the procedure (1.0 min; 95% CI: 0.4 to 1.6 or the occurrence of complications (aOR 1.00, 95% CI: 1.00 0.98-1.02). Older age was associated with increased likelihood of recanalization (aOR 1.02; 95% CI: 1.00 to 1.04). Good outcome was significantly decreased, but inversely associated with age (aOR 0.97; 95% CI: 0.93 0.95 to 1.00).

Conclusion: Although the chances of good outcome for older adults with AIS who underwent IAT are decreased, we did not find the expected association of age with recanalization, complications or procedure duration. Our results do not support arguments for an upper age limit in randomized clinical trials of intra-arterial treatment for acute ischaemic stroke.

9 Acute stroke: current treatment
17:46 - 18:00

Characterization of patients with repeated intravenous thrombolysis
M. Kablau, M. Griebe, M. Wolf, A. Gass, M.G. Hennerici, K. Szabo
Department of Neurology, University of Duisburg-Essen, Essen, GERMANY; Department of Radiology, University of Heidelberg, Heidelberg, GERMANY

BACKGROUND: Data concerning the effect of repeated use of IV in acute stroke patients is limited. Cytotoxic side effects of IV and the fear of hemorrhagic transformation might be reasons to withhold thrombolitics for the first time. This study aimed to characterize patients with repeated IV tPA and to analyze the characteristics of these patients by comparing them with patients treated with a single dose of IV tPA.

METHODS: We identified 19 patients treated twice with intravenous tPA at our stroke centre between 2005 and 2011 from our prospectively collected stroke database. Stroke etiology was classified using the ASCO score. mRS performed after each IV tPA therapy was reviewed for ischemic stroke lesions and signs of HT.

RESULTS: The median time interval between first and second thrombolysis was 15 months (range 2 to 70). Patients were more severely affected at the 2nd admission resulting in significantly different median NIHSS scores (11 vs. 5; p<0.001) and mRS scores (5 vs. 4; p=0.05). Cardioembolism (ASCO C1) was the most likely cause of stroke in 9 (47.4%) patients leading to the first IV tPA treatment and in 2 additional (11.7%) patients leading to repeat IV tPA therapy. Six (31.6%) had an undetermined cause of stroke at both admissions. In two patients an etiology other than acute ischemic stroke was identified at both time points (stroke mimics; A0 50 C0 00). Both the first as well as the second tPA therapy led to a clear short term improvement as measured by the NIHSS (median +4 vs. -5, n.s.) and mRS (median -1 vs. -1, n.s.) scores. Five (26.3%) patients from the second treatment group developed mild HT while only 2 (10.5%) in the first treatment group did (n.s.). However, there were no major tPA related complications.

CONCLUSIONS: Repeated tPA therapy is a phenomenon with growing incidence and in our collective mainly related to (untreated) cardioembolism. In our patients repeated treatment was efficacious regarding outcome and safe concerning possible hemorrhagic or immunological complications.
Acute stroke: clinical patterns and practice
16:48 - 16:58

Inadvertent Administration of Systemic Ipsi: Is Safety Compromised?
University of Alabama at Birmingham, Birmingham, USA

Background: When time is brain, physicians don’t have to acquire a detailed medical history prompting difficult decisions with the available information. We aimed to evaluate safety of inadvertent administration of systemic Ipsi at our center.

Methods: Consecutive patients who received systemic Ipsi from our database were analyzed for on-label or inadvertent Ipsi administration. Minor stroke was defined as an NIHSS < 4. Symptomatic intracerebral hemorrhage was defined as an increase of > 4. Median discharge NIHSS score was compared to admission NIHSS score using a paired t-test.

Results: 191 Ipsi cases were identified with 158 (82%) administered at our center and another 41(21%) administered as a telephone consult supported drip and ship. Age was 66±19 with median admission NIHSS scores of 12 (IQR 7-17). All had normal CT scans or potentially reversible early signs of ischemia without hypotension. Inadvertent use occurred in 31(17%) cases. Stroke mimic (n=2), questionable onset time (8), stroke within past 3 months (1), major surgery within past 14 days (1), blood pressure >185/110 at time of admission (3), other (1). All had normal CT scans or potentially reversible early signs of ischemia without hypotension. Inadvertent use occurred in 31(17%) cases. Stroke mimic (n=2), questionable onset time (8), stroke within past 3 months (1), major surgery within past 14 days (1), blood pressure >185/110 at time of admission (3), other (1).

Conclusion: Our findings support selection of patients for intravenous Ipsi based on identifying patients with disabling deficits and brain imaging consistent with potential reversibility of ischemia. The inadvertent Ipsi use with such an approach appears to be as safe as routine on-label use in our study.

Acute stroke: clinical patterns and practice
16:58 - 17:08

Increased amount of physical activity in the acute phase is associated with good functional outcome 3 months after stroke
T. Askim¹, J. Bernhardt², Ø. Salvesen¹, B. Indredavik²
Norwegian University of Science and Technology, Trondheim, NORWAY, Florence Neuroscience Institutes, Melbourne, AUSTRALIA

Background: Helping patients be physically active early after stroke is believed to contribute to the good functional outcome achieved with treatment in a comprehensive Stroke Unit, but the association between physical activity and outcome is still unclear. The aim of this study was to examine the association between the patient activity levels and 3 month functional outcome in an unselected group of acute stroke patients.

Methods: All consenting patients admitted to the Stroke Unit at St. Olav’s Hospital, Trondheim University Hospital, Norway were included in this prospective observational study. Patients were observed using a standardised method of observation at 10-minute intervals from 8:00 AM to 5:00 PM over a single day, between 1-14 days post stroke. Motor activity was recorded at each observation, and classified as: 1) in bed, 2) sitting out of bed and 3) higher motor activities (transferring/walking).

Results: 88 patients (58 % male) were included. Mean (SD) baseline characteristics were: age 78.7 (9.1) years, time since stroke; 6.6 (3.7) days and NIHSS score; 7.4 (6.4) points. 38.6 % had moderate to severe stroke (NIHSS ≥ 9). Linear regression adjusted for stroke severity and age, with 3 month mRS as dependent variable and motor activity as independent variable showed that increased motor activity in the acute phase was associated with reduced 3 month mRS, with a point estimate of −0.34 (95% CI -0.65 to -0.03). Each increase of 10% in motor activity was associated with a 0.17% decrease in mRS (p = 0.04). A similar trend was observed in the subgroup analysis for manual activities (−0.33 (95% CI -0.67 to -0.001); p = 0.05).

Conclusion: The results from this study support that physical activity is favourable for acute stroke patients.

Acute stroke: clinical patterns and practice
17:08 - 17:18

Effects of blood pressure lowering in different subtypes of acute ischaemic stroke: Results from the Scandinavian Candesartan Acute Stroke Trial
E. C. Sandset, A. G. Hornslien, E. Berge
Oslo University Hospital Ullevål, Oslo, NORWAY

Background: The Scandinavian Candesartan Acute Stroke Trial (SCAST) found no benefits of blood pressure (BP) lowering treatment with the angiotensin receptor blocker candesartan in acute stroke. We have investigated the impact of treatment within different subtypes of ischaemic stroke.

Methods: SCAST was a randomised, placebo-controlled trial of candesartan in 2,029 patients with acute stroke (>30 hours, ischaemic or haemorrhagic) and elevated BP (systolic BP ≥180/110 mm Hg). Treatment was administered for 7 days. Stroke was classified according to the Oxfordshire Community Stroke Project (OCSF) classification. There were two effect variables: the composite end-point of vascular death, myocardial infarction or stroke (analysed using Cox regression) and functional outcome at 6 months (mRS) (analysed using logistic regression). We adjusted for baseline systolic BP and age.

Results: 1,737 patients with ischaemic stroke were enrolled: total anterior (TACI) 129, partial anterior (PACI) 930, posterior (POCI) 236, lacunar infarction (LACI) 510 and 8 other patients. Patients with TACI were older, had more severe strokes, and more often atrial fibrillation or previous stroke/TIA. POCI patients had lower SBP and DBP at baseline. Within each subtype, baseline characteristics were well balanced between the treatment groups. The figure shows the results for both effect variables. We found no differential treatment effect in any of the stroke subtypes for either of the effect variables. For functional outcome there was a non-significant trend towards a better effect in patients with large infarcts than in those with smaller infarcts.

Conclusion: These findings support the main findings in SCAST, that there is no indication for routine blood pressure lowering treatment in the acute phase of ischaemic stroke. A possible better treatment effect in patients with larger infarcts than in those with smaller infarcts needs to be assessed in further trials.
5 Acute stroke: clinical patterns and practice
17:38 - 17:20

Prestroke glycerolcreatinine in associated with good outcome in stroke patients treated with reperfusion therapies
L. Lülü, A. Cervra, S. Amato, X. Uria, V. Obuch, A. Chamorro
Comprehensive Stroke Center, Hospital Clinic, Barcelona, MATEN

Background: Diabetes is a well known risk factor for stroke. Both diabetes and hyperglyceremia at admission have been associated to a worse outcome after stroke. However, it is unknown whether glycerina at admission or pre-
stroke glycerol (PSG) is the responsible for the bad prognosis. A recent report indicated that an inadequate PSG, evaluated with glycated hemoglobin (HbA1c), was an independent predictor for bad outcome in in-
hospital stroke patients. The aim of our study was to evaluate the association of basal glycerina and HbA1c with outcome in stroke patients treated with reperfusion therapies.

Methods: A cohort of 294 ischemic stroke patients admitted from 10/2008 to 12/2010 and treated with reperfusion therapies was analyzed. All patients had a record of stroke risk factors, baseline NIHSS, clinical and laboratory
variables, and outcome at 3 months. Good outcome was defined as a modified Rankin Scale (mRS) 0-2. Excellent outcome was defined as mRS 0-1. PSGC was studied during admission with HbA1c. Assessment of variables
associated with outcome was performed with univariate and multivariate analysis, adjusting by age and baseline NIHSS.

Results: Overall, 246 patients had basal glycerina and HbA1c at admission recorded. Basal glycerina was not different among patients with good or bad outcome (135.5 ± 46.1 vs. 140.8 ± 50.3; p = 0.35). HbA1c was lower in patients with good outcome (5.76 vs. 6.16; p<0.03), or excellent outcome (5.71 vs. 6.01; p<0.03). In the multivariate analysis, HbA1c was independently associated to good (OR 0.76, IC95% 0.61-0.96; p=0.019) and excel-

Conclusions: In this cohort of patients treated with reperfusion therapies, adequate PSG, rather than HbA1c, was associated with a better prognosis after acute stroke. The association was strongest amongst diabetic pa-

6 Acute stroke: clinical patterns and practice
17:26 - 17:38

Do all patients admitted to hospitals with acute ischemic strokes need in-hospital echocardiography?
B.K. Menon, J.L. Coulter, S. Hall, C. Godzwon, S. Wierkes, S. Hutchinson, M.D. Hill, S.B. Coutts
UNIVERSITY OF CALGARY, CALGARY, CANADA

Background: We sought to determine the diagnostic yield of echocardiography in ischemic strokes and its utility in changing medical management. In addition, we explored the possibility of creating a risk model that can help
in guiding the use of echocardiography in in-patients with acute ischemic strokes.

Methods: This is a retrospective chart review of patients admitted to the Foothills medical center, Calgary from Jan 2009 to June 2010 with a diagnosis of acute ischemic stroke who had TTE and/or TEE as part of inpatient-di-
agnostic evaluation. Clinical findings included baseline cardiac exam and ECG were noted. High yield findings on TTE and TEE were defined using 2008 American Heart Association guidelines. Imaging at baseline (CT and/or
MRI) was analyzed and data dichotomized into patterns suggestive of a proximal embolic source (cardiac/ace) and those not (large vessel involved, isolated small subcortical infarcts).

Results: 804 patients (56.3% male, mean age 69±14.4 yrs) were included in the study, 371 (34.8%) had TTE and 68 (15.5%) had TEE in addition. Anticoagulation was added in 69 (32.9%) patients of which 33/69 had afib on ECG. High yield echo findings were seen overall in 35/49 (4%) patients. High yield echo findings that changed medical management was found in 16/43/9 (3.6%) with either a history of CAD, an abnormal cardiac exam, abnormal ECG or a “proximal embolic source” imaging pattern when compared to 2/43/9 (0.43%) when these variables were all normal. After adjusting for age, gender, presence of CAD at baseline, imaging and ECG abnormalities, the odds for adding anticoagulation given high yield echo findings was 11.37 (95% CI 4.81 – 26.86, p<0.0001).

Conclusion: The yield of TTE/TEE resulting in change in medical management (adding anticoagulation) is low. Nonetheless, the odds of adding anticoagulation given high yield findings on TTE/TEE is high. We intend to de-
velop a risk model utilizing CAD history, cardiac exam, ECG and neurovascular imaging that can be used to triage patients for in-hospital vs. Outpatient echocardiography.

7 Acute stroke: clinical patterns and practice
17:38 - 17:49

Graduated compression stockings in stroke: the effect of the neutral CLOTS 1 trial on the use of graduated compression stockings, as assessed in the ‘Efficacy of Nitric Oxide Stroke’ (ENOS) trial
S. Anoklekar, C. Hogg, D. Bereczki, N. Spring, A. Gommeas, E. Berge, J. Wardlaw, M. Dennis, P. Bath
University of Nottingham, Nottingham, UNITED KINGDOM, Semmelweis University, Budapest, HUNGARY, J. Hawkins, Bay District Health Board, Hastings, NEW ZEALAND, Ullswater University Hospital, Oslo, NOR-
WAY, University of Edinburgh, Edinburgh, UNITED KINGDOM

Background: Current evidence suggests that the time lag from the publication of randomised clinical trial (RCT) results to changes in prescribing behaviour for drugs is gradually reducing. However, the effect of results of clinical trials of devices can influence clinical practice rapidly, at least in some countries and in respect of a neutral result for a widely used and moderately expensive (time and finance) in-

Conclusions: Patients with acute stroke who arrive outside of normal hours wait longer for key interventions and are less likely to be thrombolysed. However, in this cohort there was no association with 7 and 30 day mortality.

Are stroke patients who present at hospital outside of normal hours more likely to die?
J.T. Campbell, M. Roughton, S.J. Kavanagh, A.M. Hoffman, A.G. Rudd, P. Tyrrell
Royal College of Physicians on behalf of the Intercollegiate Stroke Working Party, London, UNITED KINGDOM, Guy’s and St Thomas’ NHS Foundation Trust, London, UNITED KINGDOM, University of Manchester, Manchester, UNITED KINGDOM

Background: We have previously presented data from the Stroke Improvement National Audit Programme (SINAP) comparing mortality and quality of care for those patients who arrive at hospital within normal hours and out-
of-hours. Our previous study showed that quality of care and 30 day mortality was worse for those patients presenting out of hours. We now present data using a much larger cohort of patients, with adjustments made.

Methods: SINAP is a prospective database of acute stroke patients, documenting details of processes of care over the first 72 hours. We compared several quality of care indicators and mortality at 7 and 30 days, for patients who arrived within normal hours (Monday – Friday 8am to 6pm) and for those who arrived out of hours. Quality of care was defined according to time from arrival at hospital to interventions (e.g. CT scan), whether the patient received thrombolysis where eligible and other measures. Mortality is based on data linkage with a national database of registered deaths. In comparing results across the two groups, our data were adjusted for age, gender, level of consciousness in the first 24 hours and Oxford Community Stroke Project (OCSP) classification.

Results: 30,51 stroke patients were newly admitted to 99 hospitals across England from April 2010 and September 2011. Out of hours care is significantly associated with longer arrival at hospital to stroke bed times, longer CT scan de-
lays and lower rates of thrombolysis amongst eligible patients. Unadjusted, the 30 day mortality rate was 11.8% (167/1416) compared with 13.8% (203/1518) for patients arriving out of hours (p<0.001). After adjusting the data (as outlined in methods) mortality differences were no longer significant (p=0.147).

Conclusions: Patients with acute stroke who arrive outside of normal hours wait longer for key interventions and are less likely to be thrombolysed. However, in this cohort there was no association with 7 and 30 day mortality.

8 Acute stroke: clinical patterns and practice
17:48 - 17:58

Are stroke patients who present at hospital outside of normal hours more likely to die?
Royal College of Physicians on behalf of the Intercollegiate Stroke Working Party, London, UNITED KINGDOM, Guy’s and St Thomas’ NHS Foundation Trust, London, UNITED KINGDOM, University of Manchester, Manchester, UNITED KINGDOM

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Out of hours patients compared with normal hours patients

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Odds Ratio</th>
<th>95% CI</th>
<th>p value</th>
<th>Number of patients</th>
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<td>30 day mortality</td>
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<td>0.94</td>
<td>3.17</td>
<td>0.04</td>
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<td>All day mortality</td>
<td>1.08</td>
<td>0.98</td>
<td>1.21</td>
<td>0.38</td>
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<td>Thrombolysed if eligible</td>
<td>0.37</td>
<td>0.29</td>
<td>0.49</td>
<td>0.008</td>
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<tr>
<td>Arrived to stroke bed time</td>
<td>0.97</td>
<td>0.87</td>
<td>1.08</td>
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<tr>
<td>Arrived to stroke team time</td>
<td>0.80</td>
<td>0.78</td>
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</tbody>
</table>

21. European Stroke Conference 67

Lisbon, Portugal 2012
Cognitive Impairment in Lacunar Stroke Patients. The Secondary Prevention of Small Subcortical Strokes (SPS3) trial. O.R. Bousser1, L.A. Pace1, A.M. Roldan1, L. Catena1, L.A. McCrae1, R.G. Har1
1University of British Columbia, Vancouver, CANADA, 2University of British Columbia, Vancouver, CANADA, 3Boston University, Boston, USA, 4University of Alabama, Birmingham, USA, 5McMaster University, Hamilton, CANADA

Background: Lacunar strokes are a cause of cognitive impairment and dementia, however adequate characterization is still lacking. The aim of the study was to estimate prevalence of neuropsychological (NP) impair- ment and its relationship with white matter hypointensities (WMH) on MRI.

Methods: We included patients with CAA (diagnosed by the modified Boston criteria) from 4 specialist centres with clearly documented TFNE and no known explanation other than CAA. Clinical, imaging and follow-up information was identified in a systematic review.

Results: Exclusively half (n=177) of the 354 thrombolytic cases occurred during business hours, and the ASN attended 83% of these cases when the roll was FT (35%) and when FT (35%) when FT. No difference was seen in median door-to-CI times (25 minutes); however faster median door-to-needle times were achieved when the ASN was FT (80 min) vs FT (85 min) compared to when the roll was FT (91 minutes, p<0.005) and more patients were treated within 60 minutes of arrival (96% vs 91%, p=0.004). Protocol violations were greatest for the period when no ASN was available (27% vs FT 19% and FT 9%, p=0.02) as rates of AICH (18% vs FT 9% and FT 32%), although this was not statistically significant. Rates of SICH (4.5%) and in-hospital deaths (9%) were low throughout and not statistically different throughout the three ASN periods. Overall thrombolytic treatment rates were consistent throughout the three ASN time periods and have slowly increased over time (12% to 18%) especially since the extension of the time treatment window to 2004 in 4.5 hours.

Conclusions: The Acute Stroke Nurse role seems to have a positive impact on thrombolysis and protocol adherence, with best thrombolysis times achieved with a FT ASN.

Small vessel stroke and white matter disease
16:00 - 16:30

Oral Session. Small vessel stroke and white matter disease

Chair: H. Bänzer, Germany, and D. Tanne, Israel

1 Small vessel stroke and white matter disease
16:00 - 16:40

Small vessel stroke and white matter disease
16:40 - 16:50

Auditorium III/IV

16:30 - 18:00

Scientific Programme
5 Small vessel stroke and white matter disease
17:56 - 17:59

Does the differential distribution of acute lacunar infarcts and white matter lesions in the brain explain why lacunar infarcts but not white matter lesions present with acute symptoms? M.C. Valdes-Hernandez1, L.C. Maccormick1, F. Doublé1, S. Makin1, C. Sadlow1, S. Munoz Mangete1, J.M. Wardlaw1
University of Edinburgh, Brain Research Imaging Centre, Edinburgh, UNITED KINGDOM1, University of Edinburgh, School of Medicine, Edinburgh, UNITED KINGDOM1, University of Edinburgh, Division of Geriatric Medicine, Edinburgh, UNITED KINGDOM1, University of Clinical Neurosciences, Edinburgh, United Kingdom

Background: Acute and old non-cavitating lacunar infarcts look very similar to age-related white matter lesions (WML) on MR imaging (except DWI). Lacunar infarcts cause symptoms but WML accumulate apparently silently, the reason for this symptomatic difference being unclear. We hypothesised this is because lacunar infarcts affect primary motor/sensory tracts, whilst WML commonly affect less eloquent areas.

Method: We recruited patients with an acute lacunar ischaemic stroke clinical syndrome and a relevant DWI-positive lesion. We extracted the acute lacunar lesions using optimized threshold delineation in FLAIR guided by DWI. We registered all images against an age-relevant brain template using affine registration, calculated the probability distribution (PD) of the lacunar lesions and compared this with the PD of asymptomatic WML from stroke-free subjects of similar age.

Results: In 175 patients, mean age 65±9.12 years, median lacunar infarct volume was 0.9ml (IQR 1.1). The highest probability of acute lacunar infarcts was in the mid posterior limbus of the internal capsule (PD 0.3±mml), with decreasing PD: up primary motor+sensory tracts in centrum semiovale/CSt to peripheral subcortices (PD 0.2±mml), to peripheral thalamus (PD 0.1±mml), medial lentiform nucleus (PD 0.09±mml), posterior end of the anterior internal capsule andpons (PD 0.02±mml) but nowhere else. In contrast, in 120 controls (age 71-73 years), WML (median volume 7.7ml, IQR 13.4), were distributed symmetrically anteriorly to posteriorly, right to left, in pons/evintriculis, internal-external capsules, and brainstem white matter and throughout the basal ganglia.

Conclusion: Lacunar infarcts cause symptoms mainly because they affect primary motor or sensory tracts whereas WMLs, often of similar appearance, affect less eloquent regions. As both are perforating arteriolar territories, most acute lacunar infarcts and WML may have a similar pathology. If symptoms can be explained by eloquence of location.

6 Small vessel stroke and white matter disease
17:59 - 17:30

Catharina Hospital Eindhoven, the Netherlands, Eindhoven, THE NETHERLANDS1, Department of Neurology, Center for Neuroscience, Donders Institute for Brain, Cognition and Behaviour, Radboud University Medical Center, Nijmegen, THE NETHERLANDS8

Background: Vascular factors play a Alzheimer’s disease, presumably due to emergence of white matter lesions (WML). However, important white matter structures in the eloquio of AD, including the corpus callosum (CC) remain invariably free from macroscopical WML, although microstructural changes assessed with diffusion tensor imaging have been described in the CC. Most of these microstructural changes in other white matter areas have been related to vascular factors, this has never been investigated in the CC.

Objective: To investigate whether hypertension and its treatment status is related to the DTI changes in the CC in patients with WML.

Methods In 505 subjects with cerebral small vessel disease, age 55-85 years, we cross-sectionally investigated the relation between hypertension, hypertension treatment status and the microstructural integrity of the CC. All of the subjects underwent 1.5-T MRI and DTI scanning. Fractional anisotropy (FA) and mean diffusivity (MD) were calculated in four substructures of the CC (genu, anterior body, posterior body and splenium). Differences between groups were calculated with age and sex adjusted analysis of covariance.

Results: 485 were women, mean age was 65.6 years. Compared to normotensive subjects, hypertensive subjects had a significant higher mean MD and a lower mean FA in both anterior body and splenium (mean FA difference: 0.018; P = 0.049; 0.030; P = 0.012). Treated uncontrolled hypertensive subjects had the lowest microstructural integrity compared to normotensives (mean FA difference: 0.033; P = 0.002; 0.044; P = 0.003).

Conclusions Hypertension is related to microstructural integrity changes of the CC and may be related to cognitive performance. Adequate blood pressure treatment might postpone these changes.

7 Small vessel stroke and white matter disease
17:30 - 17:49

Creation and validation of the CADASIL scale: a screening tool to select patients for the NOTCH3 gene analysis F. Pescini3, S. Namuccci1, B. Bertaccini1, E. Salvadori2, S. Bunchi1, M. Ragou1, C. Sarti1, R. Valenti1, M. Moretti1, S. Chi6, M.L. Stroom2, A. Federico1, D. Inzitari1, L. Ponzoni1, M.L. Strol3
Department of Neuropathological and Psychiatrist, University of Florence, Florence, ITALY1, Division of Neuropathology, University of Florence, Florence, ITALY1, Department of Neurological and Behavioural Sciences, University of Siena, Siena, ITALY1, Division of Neurology, C. Mazioni Hospital, Assisi Piacenza, Assisi Piacenza, Italia1, Department of Imaging, Neuroradiology Unit, Careggi University Hospital, Florence, Florence, ITALY1

Background: CADASIL (Cerebral Autosomal Dominant Arteriopathy with Subcortical Infarcts and Leukoencephalopathy) is an inherited disease caused by NOTCH3 gene mutations. The phenotype is highly variable, and, although the full clinical-neuroimaging picture may suggest CADASIL, no characteristic is pathognomonic. Thus, the genetic test remains the diagnostic gold standard, but because it is costly and time-consuming, a pre-genetic screening appears desirable.

Methods: We developed the CADASIL scale, a screening tool to be applied in the clinical setting. A preliminary scale was developed assigning weighted scores to the most common disease features based on their frequencies obtained in a pooled analysis of the largest international CADASIL series. We performed a Receiver Operating Characteristic analysis after the application of this scale to 61 CADASIL and 54 NOTCH3-negative probands. To improve the accuracy of the scale, we then developed an ad-hoc optimization algorithm to detect the definitive scale. A group of patients affected by age-related leukoencephalopathy was finally included in the algorithm to evaluate the scale stability.

Results: The cut-off score of the preliminary scale had a sensitivity of 92% and a specificity of 54% versus the genetic diagnosis. Applying the definitive scale, a cut-off score with higher sensitivity (96.7%) and specificity (74.2%) was obtained. This scale was robust to the contamination of the group of age-related leukoencephalopathy patients.

Conclusions: The CADASIL scale is a simple and sufficiently accurate screening tool to select patients with a high probability to be affected by the disease and therefore to be subjected to the genetic testing.

8 Small vessel stroke and white matter disease
17:50 - 17:59

Is obstructive sleep apnoea a risk factor for leukoaraisis? U.G. Schulz1, J.H. Mars2, S. Howard1, P.M. Rothwell1, J.D. Stradling1
Stroke Prevention Research Unit, Nuffield Department of Clinical Neurosciences, Oxford University, Oxford, UNITED KINGDOM1, Nuffield Department of Clinical Medicine, Oxford University, Oxford, UNITED KINGDOM1

Background: Obstructive sleep apnoea (OSA) is associated with hypertension, nocturnal blood pressure (BP) spikes and an increased risk of stroke. It may therefore also be associated with a higher risk of developing leukoaraisis (LA).

Methods In 503 subjects with cerebral small vessel disease, age 50-85 years, we cross-sectionally investigated the relation between hypertension, hypertension treatment status and the microstructural integrity of the CC. All of the subjects underwent 1.5-T MRI and DTI scanning. Fractional anisotropy (FA) and mean diffusivity (MD) were calculated in four substructures of the CC (genu, anterior body, posterior body and splenium). Differences between groups were calculated with age and sex adjusted analysis of covariance.

Results: Of similar age.

Conclusion: The CADASIL scale is a simple and sufficiently accurate screening tool to select patients with a high probability to be affected by the disease and therefore to be subjected to the genetic testing.

9 Small vessel stroke and white matter disease
17:59 - 18:00

HHRonnaktivtät: Physical Activity and Healthy Ageing – Influence of Small Vessel Disease M. Goczy1, C. Blahak1, A. Schlude1, H. Leweling1, J. Saur1, P. Eisele1, C. Blahak1, A. Gass1, M. Hennerici1, K. Szabo1
Department of Neurology, Universitätshospital Zürich, Zürich, Schweiz1, Department of Neurology, University of Heidelberg, Mannheim, GERMANY

BACKGROUND: Growing old in good physical and mental shape is of great personal and economical interest for both the individual and the society. Known predictors of healthy ageing are high physical, and intellectual and spiritual activity during lifetime, high socioeconomic status and moderate lifestyle. In our project HHRonnaktivtät we are investigating the effect of the initiation of a regular physical work-out on memory functions in a cohort of non-demented senior citizens. In addition, we will analyse the impact of incidental small vessel lesions on the adaptive mechanisms. METHODS: HHRonnaktivtät is a randomised, single-centre, parallel cross-over clinical trial. Out of 128 candidates aged 60-70 years, 71 were randomised in five groups. Structured physical training, comprising of three one-hour units of aerobic exercise per week in a period of three months, is being conducted in a collaborative fitness centre. Preceding a three-month control phase and before and after the training cycle the following investigations are being performed: neurological examination and history, assessment of adverse events, stance and time to stand up from supine position, grip strength, ankle and arm oscillation, cognitive assessment (MMSE, trail making test, verbal fluency, seconder and third digit span, delayed word recall, visual memory, finger tapping, frontal and temporal lobe executive functions), and an MRI scan (MRI with working memory paradigm, connectivity analysis, DTI, MP-RAGE, 3D-FLAIR, SWI). RESULTS: The study is ongoing, two of the five groups have finished the three-month training cycle, 22 of these 26 participants were very satisfied with the experience and continue with the training. The other three groups will be practicing until May 2012. CONCLUSIONS: HHRonnaktivtät addresses important scientific questions concerning healthy ageing and its underlying mechanisms. Preparation. Preliminary results of the study will be communicated.
Scientific Programme

18:15 - 19:45        Satellite Symposium Siemens
Auditorium VII

### Optimizing stroke diagnosis and treatment
Chair: E.B. Ringelstein, Germany

- Comprehensive stroke imaging with multimodal CT
  A. Kemmling, Germany
- The value of MR for the diagnostic of acute stroke
  F. A. Fellner, Austria
- New insights on pharmacological approach of acute ischaemic stroke
  A. Dávalos, Spain

**Sponsored by Siemens**

18:15 - 19:45        Satellite Symposium CoAxia et al.
Auditorium V

### Emerging technologies for acute treatment
Chair: W.D. Heiss, Germany and M.G. Hennerici, Germany

- Recanalization/clot retrievers:
  - Solitaire Retrospective Study – Looking at the data
    J. Gralla, Switzerland
  - A novel three-dimensional revascularization device: histopathology results from a rabbit model and early clinical experience with the Penumbra Separator 3D
    A. Mpotsaris, Germany

- Perfusion augmentation and additional treatment strategies
  - Spheno palatine ganglion stimulation for treatment of AIS in a time window of 24 hours: results of the ImpACT-24A study
    J. Saver, USA
  - Outcome expectations in stroke treatment: a new analysis of SENTIS
    H.-C. Diener, Germany
  - NeuroThera® Efficacy and Safety Trial - 3 (NEST-3): pivotal study for acute ischemic stroke
    W. Hacke, Germany

**Sponsored by Covidien, Penumbra, Brainsgate, CoAxia and PhotoThera**

18:15 - 19:45        Satellite Symposium CoAxia et al.
Auditorium I

### Stroke Treatment in the 21st century
Chair: J. Ferro, Portugal

- Treatment based on neuroimaging
  P. Schellinger, Germany
  D. Molina, Spain

**Sponsored by Ferrer Group**
### Friday 25 May 2012 - Programme Overview

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### 8:30 - 10:00 Mini Symposium 7  
**Intracranial atherosclerosis: an update**

**Chairs:** M.G. Hennerici, Germany and K.S. Wong, China

- Natural history and prognosis of intracranial atherosclerosis
  - K.S. Wong, China
- Imaging of intracranial atherosclerosis
  - CTA: M. El Koussy, Egypt/Switzerland
  - MR: A.G. van der Kolk, The Netherlands
  - Ultrasound: R. Kern, Germany
- Endovascular treatment: the SAMMPRIS trial
  - M. Chimowitz, USA
- Controversy about treatment
  - Pro: Aggressive medical treatment
  - O. Singer, Germany
  - Pro: Interventional treatment
  - G. Schroth, Switzerland

### 8:30 - 10:00 Mini Symposium 8  
**Stroke in the elderly**

**Chairs:** E. Touzé, France and S. Engelter, Switzerland

- The epidemiology of stroke in the elderly
  - P. Rothwell, UK
- Prevention in the very elderly
  - B. Ovbiagele, USA
- Thrombolysis
  - S. Engelter, Switzerland
- Falls and cognition
  - C. Blahak, Germany

### 8:30 - 10:00 Academic Symposium 5

**Joint Symposium WFRN and ESC**

**Does functional imaging help to plan stroke rehabilitation?**

**Chairs:** R. Seitz, Germany and H. Chabriat, France

- Early changes are relevant for recovery
  - R. Seitz, Germany
- White matter tract changes and recovery
  - H. Chabriat, France
- Brain organisation and reorganisation to understand neglect and extinction
  - C. Weiller, Germany
- Alternative approaches to aphasia
  - G. Schlaug, USA
Predictors of future ipsilateral cerebrovascular events in patients with asymptomatic carotid stenosis: results from a 3T MRI study
M.L. Mono1, A. Karamanov2, H. Stobbe3, L. Remonda4, A. Galamian5, S. Jung6, O. Findling7, G.M. De Maeseneir8, R. Lidd1, C. Kiefer9, C. Stinck, F.P. de Kleijn6, D.P.V. de Kleijn6, G. Jan de Borst10, G. Pantazopoulos11, P.M. Rothwell12

Background: For symptomatic patients with moderate carotid artery stenosis the risk-benefit for intervention is often marginal and is dependent on timing of surgery, presenting event, gender, age, and co-morbidity. Various modalities of plaque imaging have been promoted as potential tools to provide additional clinically useful risk stratification, particularly in patients with moderate stenosis. However, it remains uncertain to what extent those modalities predict risk of future stroke.

Methods: We related carotid plaque history (using validated semi-quantitative scales) to predicted individual 5-year stroke risk in two large consecutive series of patients (n=1680) undergoing carotid endarterectomy (Oxford; from PROSELtic trial) and carotid stenting procedures (Toronto; using the risk prediction model derived from the ECST trial and validated in the NASCET trial).

Results: Predicted 5-year stroke risk (top vs bottom quartile) was related to the following plaque features: thrombus (OR=1.46, 95% CI 1.01-1.94, p=0.03), fibrous content (0.65, 0.49-0.87, p=0.004), macrophage infiltration (1.36, 1.04-1.81, p=0.02), large lipid core (1.34, 0.99-1.81, p=0.06) and overall plaque instability (1.41, 1.86-1.98, p<0.002). However, predicted risk was not associated with: haemorrhage (1.13, 0.85-1.58, p=0.42) cap thickness (1.17, 0.74-1.85, p=0.57), or calcification (0.71, 0.46-1.10, p=0.16). Findings were similar for plaques removed within 30 days of a TIA/stroke, for patients on statins prior to their event, and in both of the individual studies.

Conclusions: Some carotid plaque features correlate with predicted stroke risk, but other features targeted by current imaging modalities (haemorrhage, cap thickness, and calcification) are not correlated with stroke risk. It also remains uncertain whether any plaque features predict stroke independently of age, sex and more easily measured traditional vascular risk factors.

Vascular imaging
8:50 - 9:00

Imaging of unruptured intracranial aneurysms at 7.0 Tesla MRI.
B. Rölling1, on behalf of the 7T aneurysm study group
University Medical Centre Utrecht, Utrecht, THE NETHERLANDS

Background: Unruptured intracranial aneurysms (IA) are present in 2-3% of the population. Ruptured IA give rise to a subarachnoid haemorrhage with high mortality and morbidity. The main risk factor for IA rupture is size of the IAs. Risk stratification for rupture is poor. Therefore other determinants of rupture are needed. The aspect of the IA wall and its motion and the 3D flow are potential risk factors. In this pilot study at 7.0 Tesla MRI, we evaluated the feasibility to image these markers with higher resolution.

Methods: 7 patients with 10 sacular unruptured IA underwent 7.0 Tesla MRI with a 32 channel SENSE receive head-coil with a set protocol. One patient had 4 unruptured IA. Magnetization prepared inversion recovery turbo-spin-echo (MIPR-TSE) imaging was used to image the IA wall with a resolution of 0.8x0.8x0.3 mm3. Temporal and 3D spatial flow characteristics of the IA and its parent vessel were measured using 3D time-resolved phase contrast angiography (PCA, 0.5 x 0.5 x 5.0 mm3) and postprocessing was perfromed to visualize flow vectors in a 3D color image. For pulsatility, defined as the expansion of the IA during the cardiac cycle, we used 3D balanced fast field echo (FFE) imaging (3 patients) and 3D spoiled FFE (4 patients).

Results: The wall of the IA was visible in 6 out of 7 patients (Figure 1). 3D flow images could be postprocessed in 4 of 7 patients. Movement and technique dependent artefacts were the reason for not visualising these characteristics.

Conclusions: Some IA flow characteristics correlate with predicted stroke risk, but other features targeted by current imaging modalities (haemorrhage, cap thickness, and calcification) are not correlated with stroke risk. It also remains uncertain whether any plaque features predict stroke independently of age, sex and more easily measured traditional vascular risk factors.

Vascular imaging
9:00 - 9:20

Are longer clots in patients with acute intracranial occlusions due to stress of blood flow around original embolus?
B. Menon1, E. Qazi2, S. Mishra3, M. Goyal4, A. Demchuk5, S. Souli6
University of Calgary, Calgary, CANADA1, Keimyung University, Daegu, SOUTH KOREA2

Introduction: We hypothesis that intracranial clots in patients with acute ischemic strokes are constituted by original embolism and freshly forming thrombus around this embolism. We therefore sought to explore the relationship between thrombus imaging characteristics and clot length. We also sought to explore whether clots were longer with longer time from stroke symptom onset to imaging.Methods: The Data is from the Keimyung registry, a prospective study that includes acute stroke patients (2005-2009) from the Keimyung University, South Korea. This data was analyzed at the University of Calgary. Only patients with known stroke symptom onset with baseline CTA and MRI and with ICA or MCA occlusion on CTA were included in the study. Interval times including stroke symptom onset to CT and onset to MR times were collected. Clot length was measured using on OXIns, an imaging processing software. A two sided p value>0.05 was considered statistically significant. Analyses were done using Stata 12. Results: In 194 patients (mean age 65.1 ± 12.28, 56.7% male, median baseline NIHSS 13 IQR 4-8) with intracranial ICA (n=50) or MCA (n=54) occlusions included in the study, median stroke symptom onset to CT time was 114 mins (IQR=104-154 mins) and median stroke symptom onset to MRI time was 160 mins (IQR=108-180 mins). In 97/194 patients with good quality NCT at baseline, hypodense sign was seen in 45/104 (44.4%). In 76/194 patients with a GRE sequence on baseline MRI, GRE + was seen in 47/194 (76.1%). Median clot length for patients with a GRE + signal on baseline MRI was 27.3 mm (IQR=22.6 mm). Conclusion: There is no difference in clot length between patients with a GRE + signal on baseline MRI compared to those without a GRE + signal. This may be due to the many factors that determine clot length.
6. Vascular imaging
9:30 - 9:40
Floating arterial thrombi in 35 consecutive acute ischemic strokes: a comparative study of etiology, course, and outcome
J.S. Jansen, J. Janideh, M. Cooke, P. Modef
Department of Clinical Neurosciences, University of Calgary, Calgary, CANADA

Background: Floating thrombi (FT) in the cervico-cerebral arteries in acute ischemic stroke (AIS) is a rare finding. The aim of this study is to analyze etiologies, risk factors, clinical and radiological presentations, treatments and outcome. Methods: In this retrospective, single center study, FT was defined as a thrombus with circumferential blood flow of at least 5 mm length on cervical and intracranial arteries. Patient characteristics, stroke etiology, radiological and clinical course and treatments were recorded along with NIHSS and modified Rankin score (mRS). Favorable outcome was defined as mRS 2 or 0 at 12 months. FT patients were compared in a multivariate analysis with all consecutive non-lacunar AIS from the Acute Stroke Registry and Analysis of Lusanne (ASTRAL) with no FT (NRT). Results: 35 AIS with FT were identified between 2001 and 2011. When compared with 1905 consecutive NPT patients, FT patients had more anterioratherosclerotic stroke (28.6 ± 15.5%), and prothrombotic conditions (14.3 ± 4.7%). Hypertension, diabetes, high cholesterol and atrial fibrillation seemed less prevalent and smoking more. In multivariate analysis, FT was associated with younger age, anterior circulation stroke and non-cardiac etiology. Admission NIHSS and day 7 mRS were comparable. 12 months recurrence was more in FT (25.7 vs. 11.3%) with all recurrences in the first 7 days. In the FT group, 7 patients (20%) received IV thrombolysis, of whom 4 had favorable outcome at 12 months. 9 patients (25.7%) underwent interventional treatment (embolectomy or aspiration-stenting), of whom all 4 with acute phase treatment had favorable outcome. Conclusions: FT in AIS is a rare condition and more frequently seen in the anterior circulation in younger patients with significant underlying atherosclerosis or prothrombotic states. Early recurrences are frequent, and preliminary analysis suggests that early intervention (embolectomy, aspiration-stenting) may be more effective than intravenous thrombolysis or antithrombotics only.

7. Vascular imaging
9:40 - 9:50
Department of Cardiac Sciences, University of Calgary, Calgary, CANADA

Background: Aortic arch atherosclerosis is a potential source of embolic stroke. CT angiography (CTA) is commonly used to evaluate acute stroke patients. We hypothesized that CTA arch to vertex is feasible and comparable to TEE for assessment of Ao Arch atherosclerosis.

Methods: Patients with ischemic stroke symptoms admitted to the Foothills Medical Center, Calgary from July 2009 to June 2011 were evaluated acutely with NCCT/CTA arch to vertex and subsequently with TEE as part of the stroke evaluation. Ao Arch atherosclerosis on source and reformatted CTA images was graded as Grade 0 (normal), Grade 1 (10-50 mm of aortic wall thickness), Grade 2 (>50 mm single/multiple areas of linear atheroma with smooth surface), Grade 3 (>10 mm single/multiple areas with irregular surface/ulceration), Grade 4 (>10 mm single/multiple complex protruding plaques with neck). TEE diagnosis of Ao Arch atherosclerosis was considered the gold standard. We assessed the prevalence, sensitivity and specificity of CTA. Results: Among 141 patients (79 male, median age 59) who had CTA and TEE for investigation of stroke etiology, 29 (21%) had Ao Arch atherosclerosis detected on TEE, TEE aortic arch abnormalities were seen in 28(20%) patients. Among 29 patients with TEE see Ao Arch atherosclerosis, 22(76%) had TAA abnormalities in Aortic Arch. CT patients with normal CTA and TEE prove Ao Arch atherosclerosis, Grade 1 Ao Arch atherosclerosis was seen in 5(71%) patients and grade 2 in 2(29%) patients. All 10 patients with grade 3-5 Ao Arch atherosclerosis on TEE had CAA abnormalities. TEE did not detect aortic disease in 6 patients where aortic atheroma seen on TEE. Overall CTA sensitivity was 76% [95% CI:0.56-0.88] and specificity was 95% [95%CI:0.88-0.97]. Conclusion: CTA arch to vertex is useful for rapid, noninvasive detection of Ao Arch atherosclerosis. TEE is unlikely to add further information in identification of moderate to severe Ao Arch atherosclerosis if initial CTA is negative.

8. Vascular imaging
9:50 - 9:55
Correlation of Large Artery Intracranial Occlusive Disease with Carotid Intima-Media Thickness and Presence of Carotid Plaque

Background: Large artery intracranial occlusive disease (LAIOD) is a predominant cause of ischemic stroke. Carotid intima-media thickness (CIMT) and presence of carotid plaque are also related to subsequent ischemic stroke. However, the correlation between them is less clear.

Methods: This was a community-based cohort study. All subjects underwent carotid duplex ultrasonography (CD) and transcranial Doppler (TCD). CIMT was measured at the far wall of distal common carotid artery (CCA) and mean CIMT value of bilateral CCAs was used. Both quartiles and cut-point of 1.0mm was used in categorical analysis of CIMT. Plaque was defined as a focal CIMT >1.5 mm. LAIOD in TCD was defined by peak systolic velocity >200 cm/s, age and presence of turbulence or muscular sound also considered. Classic vascular risk factors and CD findings were compared between subjects with and without LAIOD. Grade and adjusted odds ratios (ORs) of CIMT and presence of carotid plaque for LAIOD were calculated.

Results—Overall, 537 subjects (male: 46.9%; mean age: 54.7 years) recruited between April 2007 and September 2008 were analyzed. Mean CIMT was 0.74±0.12 mm, with the 75th percentile of 0.80mm. CIMT>1mm was identified in 132(4%) subjects. Plaques were detected in 79(14.7%) subjects. Compared with those without LAIOD, the 400(9.5%) subjects with LAIOD had greater CIMTs (0.77±0.09 mm versus 0.73±0.12 mm, p=0.044), more with CIMT of higher quartiles (p=0.007) and more with carotid plaques (25.0% versus 13.7%, p=0.035). However, after adjusting for age and other confounding factors, CIMT (OR for 4th versus 1st quartile: 1.17; 95% CI: 0.33-4.09; p=0.012) and presence of carotid plaque (OR: 1.01; 95% CI: 0.46-2.33; p=0.943) were not found to be significantly associated with LAIOD.

Conclusion—The results suggest that CIMT and presence of carotid plaque might not correlate to LAIOD. Thus attention should be drawn in clinical practice that normal CD findings do not warrant absence of LAIOD.
Identification of strategic brain networks in vascular cognitive impairment using Bayesian analysis. M. Gonik1, M. Duering1, R. Malik1, N. Zieren1, S. Reyes2, E. Jouvent2, D. Hervé2, A. Gschwendtner1, C. Opherk1, H. Chabriat2, M. Dichgans1

Background
The clinical expression of subcortical ischaemic lesions is influenced by three major factors: lesion type, volume and location. We have previously shown that lesion volumes in the anterior thalamic radiation and the fornix minor are associated with post-stroke delirium (Dueling et al. Brain 2013), the predominantly affected cognitive domain in patients with vascular cognitive impairment (VCI). To identify the combination of variables that best predict processing speed in multi-lesioned brains we extended our previous voxel-based approach by Bayesian models.

Methods
We studied 235 patients with CVDASIL, a model for pure vascular cognitive impairment. A compound score for processing speed was calculated incorporating the timed measures of the trail-making-tests (matrix A and B) and the block design test. Regional lesion volumes for white matter hyperintensities (WMH) and lacunar lesions (LL) were calculated using a probabilistic white matter atlas in standard space. Interactions between regional lesion volumes and processing speed score were examined using Bayesian network analysis. Structural equation modeling was performed for confirmatory analysis.

Results
A combination of 5 variables (as defined by lesion type, volume, and location) was identified by the exploratory Bayesian network analysis as the best predictor for processing speed. These were: WMH in the left corticospinal tract and fornices minor and LL in the left cingulum, the left anterior thalamic radiation and the left parahippocampal white matter. Together these variables explained 34% of the total variance in the processing speed score.

Conclusion
Using advanced data-mining techniques we identified a set of lesion variables which have the highest predictive value for processing speed in our population of patients with pure small vessel disease. Our findings confirm and extend previous results showing a role of frontal-subcortical neuronal circuits, in particular dorsolateral prefrontal cortical circuits and cingulate circuits, in VCI.

3 Behavioral disorders and post-stroke dementia
8:50 - 9:00

Occurrence, clinical characteristics and treatment of Post-stroke apathy - A systematic review and meta-analysis

Introduction: Post-stroke apathy can have negative consequences for patient rehabilitation and increase patient and carer giver burden. In this systematic review we assess the prevalence of post-stroke apathy, its association with depression, cognition and handicap and pharmacological treatment strategies.

Methods: A systematic review of studies published from 1980 until September 2011 was conducted using MEDLINE, EMBASE and PsycINFO. Observational studies in stroke patients, published in English, which assessed apathy using instruments recommended by consensus criteria and met our quality criteria, were reviewed by 2 observers. Apathy rate, depression rate, cognitive function, disability and general patient characteristics were collected. Pooled estimates were calculated with random-effects models. Results: Of 4600 references, 17 abstracts fulfilled criteria for selection. Eight papers reported on apathy rate. Meta-analysis of 767 patients resulted in an estimated post-stroke apathy rate of 29.8% (95%CI 24.26-34.12), I2 = 39%. Of patients with apathy, 31.4% (95%CI 14.3-45.9%) had concomitant depression (RR: 2.1, 95%CI:1.4-3.2). Apathy was associated with a 2.1 points lower mean MMSE score (95%CI 1.1-3.3) and a 4.5 years higher mean age (95%CI 1.3-6.7). Four studies associated apathy with increased disability. The region of the anterior cingulate circuit was associated with apathy in 4 studies. Two trials, 2 case-series and 5 case-reports on treatment with diverse drugs were included. None provided convincing evidence for effective treatment.

Discussion: Apathy affects almost one in three patients after stroke, in 65.6% without concomitant depression. Post-stroke apathy is associated with reduced cognitive function, higher age and increased disability. Lesions in the anterior cingulate circuit may play an important role in pathogenesis. No pharmacological treatment has been proven to be effective.

4 Behavioral disorders and post-stroke dementia
9:00 - 9:10

Apathy without depression is associated with a history of stroke and cardiovascular risk factors

Background
Apathy occurs in up to 29% of patients after stroke and hinders functional recovery. In addition, apathy has been associated with vascular disease in old age. The aim of this study was to explore the association of apathy with a history of stroke and with the presence of vascular risk factors (RF) in ELDERly without depression.

Methods
Baseline data on 5334 subjects aged 70-78 from the Prevention of Dementia by Intensive Vascular care study” (PreDIVA) were used. In this cohort of community-dwelling elderly extensive data are available on vascular disease, vascular RF and neuro-psychiatric symptoms. Apathy was assessed using the three apathy-items (GDS-3A) from the Geriatric Depression Scale (GDS-15) in subjects with no or one depressive symptom (GDS-12D≤1). The cross-sectional association of apathy with a history of stroke and with vascular RF was assessed using ordinal logistic regression. Results Of 5334 participants 695 (18.9%) had a GDS-1A ≥ 2 of these, 372 (54.3%) had a GDS-12D≥1. A history of stroke was present in 346 (9.9%) participants. Increasing apathy in the absence of depressive symptoms was associated with a history of stroke (OR 1.8 (95%CI 1.4-2.3) for every point increase in apathy score). Exploratory analysis among 1889 subjects free from stroke and other cardiovascular disease revealed a significant ordinal association of apathy with systolic blood pressure and BMI. The association of apathy and diabetes mellitus approached significance.

Conclusion
Symptoms of apathy without depressive symptoms are common in community-dwelling elderly. They are strongly associated with a history of stroke and with several vascular RF. This suggests an important role of vascular disease in the pathology of apathy. Therefore, we propose ‘vascular apathy’ as a distinct clinical entity, describing apathy without depression occurring in the context of vascular disease.
The existence of three separable attention networks—alerting, orienting, and conflict-resolution—has been suggested by behavioural, anatomical and functional imaging studies in healthy humans. We tested for dissociable impairments and dissociations between regions: conflict heightening associated with bilateral prefrontal (including precentral) lesions; orienting impairment with lesions to right pulvinar and adjacent white matter tracts (as well as right parietal lobe), and alerting impairment with anteromedial thalamic or upper pons lesions.

**Background**

The existence of three separable attention networks—alerting, orienting, and conflict-resolution—has been suggested by behavioural, anatomical and functional imaging studies in healthy humans. We tested for dissociable impairments and dissociations between regions: conflict heightening associated with bilateral prefrontal (including precentral) lesions; orienting impairment with lesions to right pulvinar and adjacent white matter tracts (as well as right parietal lobe), and alerting impairment with anteromedial thalamic or upper pons lesions.

**Methods**

We recruited 110 patients presenting with acute neurological deficits secondary to focal brain lesions on MRI (of which 108 were strokes), and 62 age-matched controls. Subjects underwent behavioural testing with the Attention Network Test (ANT).

**Results**

Patients as a whole performed poorer than controls, but there were no differences in the size of attentional network effects. However, VLSM identified selective lesion locations associated with specific attentional impairments, and dissociations between regions: conflict heightening associated with bilateral prefrontal (including precentral) lesions; orienting impairment with lesions to right pulvinar and adjacent white matter tracts (as well as right parietal lobe), and alerting impairment with anteromedial thalamic or upper pons lesions.

**Conclusions**

Our findings broadly support anatomical hypotheses regarding attentional networks, show that conflict-resolution may be mediated by processes as downstream as motor cortices, and have implications regarding the anatomical-personalization of the different networks in brain disorders such as stroke.
cognitive impairment from the literature were determined using the neuropsychological battery based on abnormality in >/=1 domain versus >/=2 domains and on the cut-off for abnormality in a given domain being >/=1, >/=1.5 and >/=2 below published norms. Performance of MMSE and MoCA in diagnosis of cognitive impairment was then determined in relation to these different neuropsychological definitions. RESULTS: Of 100 subjects (mean age 75.4±11.8 years, 44% female, 56 strokes) 5 had dementia and 4 did not complete testing. Of the 91 non-demented tested patients, 85 (69%) were classified as cognitively impaired in >/=1 domain at >/=1 sd cut-off versus only 4 (4%) in >/=2 domains at >/=2 cut-off. Performance of MMSE and MoCA were better against the more stringent definition of cognitive impairment (area under ROC curve statistics: 0.92 vs 0.78 for MMSE, 0.88 vs 0.80 for MoCA) and the cut-offs for optimal agreement were lower (>2 vs >2 on MMSE; >23 vs >26 on MoCA).

CONCLUSION: Differences in currently used designations of “abnormality” on neuropsychological testing have a major impact on apparent rates of cognitive impairment in patients with TIA and stroke, and on optimal cut-offs in validations of short cognitive tests, inevitably resulting in inconsistency and lack of comparability across studies.

9 Behavioral disorders and post-stroke dementia
8:30 - 10:00
Oral Session. Heart and brain

Heart and brain
8:30 - 10:00
Auditorium III/IV

Chairs: H. Mattie, Switzerland and R. Veltkamp, Germany

What pertinent parameter(s) to rule out paroxysmal atrial fibrillation (pAF) in stroke patients?

Urie Acid, Chronic Kidney Disease and Cognitive Performance in Patients with Atherosclerotic Disease

D. Tanne, N. Molkentritik, G. Weinstei, U. Goldboart1
The Chaim Sheba Medical Center, Tel Hashomer, ISRAEL, Boston University, Boston, MA, USA, Tel Aviv university, Tel Aviv, ISRAEL.

Background Detecting paroxysmal atrial fibrillation (pAF) after ischemic stroke is challenging. The aim of the study was to compare diagnostic properties of all parameters associated to pAF. Methods We prospectively en-
rolled consecutive acute ischemic stroke patients admitted to stroke unit. bedside Continuous ECG Monitoring (CEM) during hospitalization was systematically performed to detect pAF for naive AF patients on baseline ECG. All clinical and para-clinical data were collected. P-wave measures were performed on digitalized ECG (duration, amplitude, area, dispersion, initial and terminal force). diagnostic value for all parameters significantly associated to pAF was assessed by comparing of areas under receiver operating curves (AUC). Diagnostic properties were calculated at the Youden plot. Results Of the 200 patients included (age: 62.9±16.2, sex ratio: 1:4, NIHSS: 7±1.8, CEM duration 91 days), 45 (22.5%) were diagnosed as pAF. Parameters significantly associated to pAF were age (p=0.001), gender (p=0.001), NIHSS (p=0.0038), INP level (p=0.0001), left atrial dilata-
tion (p=0.001). For ECG analysis, area of P-wave initial portion in lead V1 emerged as independently associated to pAF (p=0.016). Diagnostic value was classified by AUC (Figure 1): area of P-wave initial portion (0.641), left atrial dilatation (0.641), NIHSS (0.453), gender (0.694), age (0.794), INP (0.861). the compilation of all the studied parameters (AUC: 0.872) did not add a supplementary diagnostic value compared to INP alone. At Youden plot, diagnostic properties for INP>=135 pg/mL were (sensitivity 91%, specificity 74%, negative predictive value 97%). Conclusion: With its good predictive negative value, INP>=135 pg/mL might rule out pAF in stroke patients. We suggest using it in clinical routine to help clinicians to target stroke patients who might benefit from prolonged ECG monitoring.

Figure 1: Receiver operating curves comparisons for all parameters associated to paroxysmal atrial fibrillation in stroke patients.

3 Heart and brain
8:50 - 9:00
Withdrawn!
**High Prevalence of Atrial Fibrillation in Unexplained Stroke Detected with Implantable Loop Recorders**

P.E. Cotter, L. Ring, P.J. Martin, E.A Warburton, M. Belham, P.J. Pugh
Cambridge University Hospital NHI Foundation Trust, Cambridge, UNITED KINGDOM

**Background:** Continuous ECG monitoring (CEM) is systematically performed for AF naives patients on baseline ECG. 2 leads were recorded by Holter function and read daily by Neurologist. When AF (>30 s) was detected, the beginning and the end of the event were collected. Patients who underwent cardioversion during hospitalization were excluded. In this cohort, areas under receiver operating curves (AUC) comparisons were performed between different terms of use to determine optimal timing and duration of CEM.

**Results:** Of the 373 patients included, 53 (14.2%) had AF on baseline ECG and were excluded. Of the 320 patients undergoing CEM during hospitalization (age: 63.5±15.6 y, sex ratio: 1.4, NIHSS: 8.7±3.6, CEM duration: 9.1 days), AF was diagnosed for additionally 52 patients (16.6%). No patients underwent cardioversion. Diagnostic value for CEM performed at admission was increased significantly with recording ECG duration (24 h AUC=0.562, 48 h AUC=0.892, 72 h AUC=0.919). Correlation is not linear and the usefulness of CEM beyond 4 days are not significant. At equal duration, diagnostic value was significantly better when ECG recording was performed at admission than randomly during hospitalization (Figure 1).

**Conclusions:** Timing and duration of CEM are significantly associated with AF diagnostic rate. We suggest a widespread use of CEM in stroke units in order to enhance the AF detection. It must be started early in acute stroke patients, and prolonged over a minimal 4 days period.

**Stepwise progression of cognitive impairment with advancing stages of heart failure**

M. Hajj, H.P. Brunner-La Rocca, A.A. Darius, R.J. Van Osteneghen
Maastricht University Medical Centre, Maastricht, THE NETHERLANDS

**Introduction:** Cognitive impairment may have significant influence on health outcome. A distinct stepwise progression in cognitive impairment as patients advance in stages of heart failure has not been demonstrated before. Methods – We included 611 patients from the Trial of Intensified versus standard Medical therapy in Elderly patients with Congestive Heart Failure (TIME-CHF) and assessed cognitive function (Hodkinson Abbreviated Men- tal Test) and severity of heart failure (New York Heart Association [NYHA] class, left ventricular echocardiogram fraction [LVEF] and N-terminal brain natriuretic peptides [NT-proBNP]) at baseline, and at 12 (N=429) and 18 months (N=382) follow-up.

**Results:** Severe cognitive impairment was present in around 10% at baseline and remained stable at follow-up. Regression analyses revealed significantly more severe cognitive impairment at baseline in patients with class IV heart failure compared to class II (OR=2.94; 95% CI=1.15 to 7.51, p=0.025), independently of age. At 12 and 18 months this difference was even more outspoken (OR=4.27, 95% CI=1.28 to 14.23, p=0.018 and OR=4.85; 95% CI=1.28 to 14.23, p=0.018).

**7 Heart and brain**

**9:10 - 9:40**

**Stepwise progression of cognitive impairment with advancing stages of heart failure**

M. Hajj, H.P. Brunner-La Rocca, A.A. Darius, R.J. Van Osteneghen
Maastricht University Medical Centre, Maastricht, THE NETHERLANDS

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CI=1.49 to 15.78, p=.009 respectively). Change in NYHA class and change in cognitive performance was positively correlated, but not significant. Severe cognitive impairment was more prevalent in patients with preserved LVEF (20.9%) compared to patients with systolic dysfunction (6.7%) at 18 months (p=.000). N-BNP levels were not associated with severe cognitive impairment.

Conclusion – Patients with more severe CHF are at increased risk for severe cognitive impairment compared to those with less severe CHF. Future research is suggested to extend follow-up time and neuropsychological assessment. When the cardiologist is able to bring down the severity of heart failure, this might also induce cognitive improvements.

8 Heart and brain
9:40 - 9:50
Occult atrial fibrillation in patients with cryptogenic stroke: A pilot study for detecting atrial fibrillation by insertable cardiac monitors
M.A. Ritter1, F. Reinke2, T. Duning1, S. Kochhäuser2, C. Pott2, D.G. Dechering2, L. Eckardt2, E.B. Ringelstein1
Department of Neurology, University Hospital Münster, Münster, GERMANY1, Division of Experimental and Clinical Electrophysiology; Department of Cardiology and Angiology, Münster, GERMANY2

Background: In about 20% of all ischemic strokes the etiology remains unknown despite thorough clinical work-up (cryptogenic strokes). It is hypothesized that a significant number of these cases have intermittent atrial fibrillation (iAF), however episodes are too rare to be detected within standard diagnostic procedures. In the setting of acute stroke, the current standard of AF detection is ECG on admission and a 24h-Holter-ECG as well as observation of the cardiac rhythm during monitoring on a Stroke Unit. Other tested diagnostic procedures such as 7 day Holter ECG or 30 day cardiac monitors have shown to increase the detection rate of iAF. We aimed to disclose the detection rate of iAF of insertable cardiac monitors (ICM).

Methods: Patients presenting with acute stroke classified as “cryptogenic” after standard evaluation including admission ECG, transesophageal echocardiography, 24h-Holter ECG, and 72h-monitoring on the stroke unit were included. An ICM (Reveal XT®, Medtronic Inc. Meerbusch, Germany) which continuously monitors cardiac rhythm was implanted. Patients sent daily seven-minute ECG-samples via telephone. All patients also received a 7day Holter-ECG after standard diagnostics.

Results: 42 patients (60+/-11 years; 19 female) were included. The ICM was implanted 35 (+/-37) days after the initial event. In all patients, the 7d-ECG showed no iAF. In three patients (7.1%) aged 67, 68 and 70 years, iAF was detected by the ICM after a mean follow-up of 62 (+/-29) days.

Conclusion: Preliminary results show that the detection rate of iAF with an ICM in patients with cryptogenic stroke is higher than after 7d Holter ECG. In the course of a large single centre study (TRACK-AF) we will soon acquire additional data to substantiate the results that allow the identification of patients benefiting from an intensified search for iAF.

9 Heart and brain
9:50 - 10:00
The Effect of Factor VII Level on Pharmacogenetic Guided Warfarin Dosing
A. Tomek1, V. Matoska2, T. Kolarova2, M. Sramek1, I. Sarbochova1, L. Taborsky2, M. Bojar1
Neurology Department of Charles University, 2nd School of Medicine and University Hospital Motol, Prague, CZECH REPUBLIC1, Molecular Genetics Laboratory, Hospital Na Homolce, Prague, CZECH REPUBLIC2

Background: Even after the advent of newer anticoagulation agents there is still a place for a well-conducted warfarin therapy. The main hindrance is a great dose variability that could be partially overcome by using pharmacogenomics. The level of anticoagulation is assessed with the prothrombin time expressed as International Normalized Ratio (INR). INR is mainly affected by plasmatic level of factor VII, less by the levels of factors I, II, V and X. The level of factors is highly variable in population and also during the time in individual patients.

Hypothesis: The level of factor VII before the initiation of warfarin treatment affects the precision of pharmacogenetic dosing algorithm, i.e. the patient with higher level of factor VII would need higher dose than estimated.

Methods: Prospective single center study. Consenting patients initiated on warfarin were analyzed for the level of factor VII before the initiation of treatment. Included patients were genotyped for CYP2C9 and VKORC1 and the dose was estimated with published algorithm. Patients were followed up for 90 days to achieve dose stabilization.

Results: 43 cardio-embolic stroke patients were included in the study (mean age 68,2 years, 20 men). The initial mean level of factor VII was 109% (61-191). The quartiles of factor VII were: < 89%, 89% – 109%, 109% - 118% and >118%. The difference of the estimated to the observed final stable dose for each quartile was: lower -0,35 mg, -0,13 mg, -0,06 mg and upper 0,13 mg (p=0,699). There was a strong correlation between the estimated and the final stable warfarin dose (r² = 0,852, p < 0,001).

Conclusion: We have observed a non-significant trend for the effect of the initial level of factor VII on the final estimated dose. Patients with higher initial level of factor VII needed more than estimated dose. The incorporation of the levels of factor VII before the warfarin treatment could improve the accuracy and efficiency of pharmacogenetic guided dosing.
Intracerebral Haemorrhage – an update
S. Greenberg, USA

11:00 - 11:30 ESC Young Investigator Award
Chairs: J.M. Ferro, Portugal and M.G. Hennerici, Germany
Auditorium I

The third international stroke trial (IST-3) of thrombolysis main results III. Effect of iv thrombolysis with iv rt-PA on death or dependency in the 3035 patients randomised: subgroup analyses
R.I. Lindley1, P. Sandercock2, J.M. Wardlaw2, M.S. Dennis2, G. Cohen2
IST-3 Collaborative Group
University of Sydney, Sydney, AUSTRALIA1, University of Edinburgh, UNITED KINGDOM2.

Background: IST-3 seeks to improve the external validity and precision of the estimates of the overall treatment effects (efficacy and safety) of rt-PA in acute ischaemic stroke, and to determine whether a wider range of patients might benefit.

Methods: International, multi-centre, prospective, randomized, open, blinded endpoint (PROBE) trial of intravenous rtPA in acute ischaemic stroke. The analysis plan specified a small number of primary subgroups (defined by age, time from stroke onset to randomisation, initial stroke severity as measured by NIH stroke score & appearance of the baseline brain scan) and an analysis of the effect of treatment on the primary outcome, subdivided by the predicted risk of a poor outcome (derived from the patient’s age and baseline NIHSS with the Konig model). The evidence for variation in rt-PA treatment effect across subgroups will be interpreted without any consideration of multiple testing. The interpretation will depend on the p-value for interaction, and the size and confidence limits for the effects in the subgroups being compared.

Results: Of the 3035 patients, 1617 were aged >80 years, 1750 were female, 332 had a lacunar clinical syndrome, 1562 had received antiplatelet therapy in the 48 hrs before randomisation. Time to randomisation was 0-3, 3-4, 4.5-6 & >6hrs in 849, 1178, 1007 & 1 patients respectively. Baseline NIHSS was 0-5, 6-10, 11-15, 16-20 and >21 in 612, 852, 601, 541 & 427 patients respectively.

Conclusion: It is anticipated that any relative benefit in the primary outcome will be smaller for subgroups which meet any of the following criteria: older age, longer delay times between stroke onset and randomisation, greater initial stroke severity, or lacunar change visible on the pre-randomisation scan.

The results of the ARTIS trial, revealing the burning clinical question whether acute aspirin treatment should be combined with IVT, will be presented in public for the first time at the European Stroke Conference 2012.

Conclusion: It is anticipated that any relative benefit in the primary outcome will be smaller for subgroups which meet any of the following criteria: older age, longer delay times between stroke onset and randomisation, greater initial stroke severity, or lacunar change visible on the pre-randomisation scan.
Influence of stent design and use of protection devices on outcome of carotid artery stenting - Results from the Carotid Stenting Trialists’ Collaboration (CSTC)


Carotid Stenting Trialists’ Collaboration

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Hôpitaux Sainte-Anne, Université Paris Descartes, Service de Neurologie, Unité Neuro-Vasculaire Centre R. Garcin, Paris, FRANCE

University Hospital Basel, Department of Neurology and Stroke Unit, Basel, SWITZERLAND

Background: Carotid artery stenting (CAS) is an alternative to endarterectomy for the treatment of carotid stenosis. We pooled individual patient data from the three large European randomized trials of stenting versus endarterectomy for symptomatic carotid stenosis (ICSS, SPACE, EVA-3S) to investigate the influence of technical aspects of CAS, such as stent design or the use of an endovascular protection device (PD), as well as clinical variables, on the risk of peri-procedural stroke or death.

Methods: The analysis was done per-protocol, and included 1548 patients treated by CAS in the three trials with information available on stent types and PD use. The primary outcome event (POE) was any stroke or death within 30 days after CAS. 955 patients were treated with closed-cell stents (interconnected stent-struts, open area <5mm²) and 593 with open-cell stents (not all struts interconnected, >5mm²). PDs were used in 959 and not used for endovascular therapy.

Results: The POE occurred significantly less often in patients treated with closed-cell stents (58 patients, 6.1%) than in those who received open-cell stents (60 patients, 10.3%). RR 0.60, 95% CI 0.43–0.85; P = 0.003. POEs occurred in 76 patients (7.9%) treated with PD and in 42 patients (7.1%) treated without PD (RR 1.08, 95% CI 0.69–1.68; P = 0.74). The effect of PD remained similar after adjustment for stent design (open cell/closed cell). Clinical variables predicting POEs were age (P < 0.001) and the type of qualifying event (P = 0.007). The effect of stent design on the POE rate remained similar after adjustment for these variables.

Conclusion: The use of stents with a closed-cell design in CAS is associated with a significantly lower risk of peri-procedural stroke or death compared with open-cell stents. Protection devices do not reduce the occurrence of symptomatic cerebral thromboembolic events, independently of the type of stent used.
Interesting and challenging cases --- p. 82
Vascular imaging --- p. 86
Brain imaging --- p. 93
Etiology of stroke and risk factors --- p. 100
Intracerebral/subarachnoid haemorrhage and venous diseases --- p. 113
Management and economics --- p. 120
Heart and brain --- p. 121
Experimental studies --- p. 123
Large clinical trials (RCTs) --- p. 130
The Great Imitator: Neurosyphilis Presenting with Acute Ischemic Infarct and with MRI Features Mimicking Herpes Simplex Infection

K. Khadjooi, A. Williams, M. Paradhan, T. Zuromskis, J. Paterson
Department of Stroke Medicine, Scarborough General Hospital, Scarborough, UNITED KINGDOM

Background:
Syphilis, known as “the great imitator” because of its protean manifestations has had a resurgence in the United Kingdom and other developed countries over the past decade.

Case report:
A 49 year-old male presented with a two hour history of severe expressive dysphasia associated with right facial weakness and made a full recovery after receiving intravenous alteplase. Post-thrombolysis MRI with DWI confirmed acute left basal ganglia infarct, but hyperintense signals in both temporal lobes on T2 images (Figure 1) raised the possibility of Herpes Simplex encephalitis (HSE). No treatment was started as he was thought to be asymptomatic.

One month later, he presented with 2 episodes of transient left-sided numbness. He recalled mild intermittent frontal headaches of 4-months duration and a brief episode of acute confusion 2 months ago. On examination, there was dyscalculia, anterograde and retrograde memory impairment (MMSE score: 21) and brown macular rash on both legs.

Repeat MRI/MRA showed persistent bitemporal hyperintense signals; and beading with attenuation of M1 segments bilaterally, consistent with vasculitis (Figure 2). A diagnosis of meningo-vascular syphilis was made based on serology and CSF findings. A course of high-dose benzylpenicillin resulted in considerable improvement in his clinical condition with one month follow-up confirming dramatic improvement in headache and cognitive function. In addition, CSF parameters improved accompanied by resolution of the temporal lobe oedema on repeat MRI.

Conclusion:
Meningovascular syphilis can cause acute stroke and present with an atypical clinical history and radiological manifestations. Clinical presentation of HSE and neurosyphilis can be similar, with neuroimaging mimicry posing a diagnostic challenge. Asymmetric bilateral mesiotemporal hyperintense signals on MRI has been held to be virtually diagnostic of HSE; however neurosyphilis can have similar radiological appearances and presents a trap for the unwary.
Intravenous thrombolysis in the presence of traumatic bone fractures

N.J. Ahmad, E Ward, C. Roffe, I. Natarajan
University Hospital of North Staffordshire, Stoke-on-Trent, UNITED KINGDOM

Introduction: Commonly agreed exclusion criteria for therapeutic intravenous stroke thrombolysis are based upon protocols used in clinical trials. These exclusions may not necessarily be evidence based and can be subject to differing interpretation. This may result in some patients missing out on the benefits of stroke thrombolysis. Much can be learnt from cases where therapeutic thrombolysis has taken place in the presence of such exclusion criteria. We present a small case series describing our experience of therapeutic thrombolysis in the presence of traumatic bone fractures. Methods: We retrospectively analysed the case records of consecutive patients from August 2009 to August 2011 who underwent thrombolysis in the presence of a traumatic bone fracture occurring within 4 weeks of the stroke. Main outcomes were early and late complications associated with the fracture site within 90 days and functional outcomes at 3 months. Results: We identified 5 cases. Fracture sites were maxillary antrum, distal radius & ulnar, distal radius, distal tibia & fibula, and metatarsal. In 4 of the cases, the fracture occurred due to falling at the time of stroke onset. In one case there was haematoma formation at the fracture site: no intervention was needed and no later sequelae occurred. All showed improvement in NIHSS score after thrombolysis: modified Rankin at 3 months did not appear to be affected. Conclusion: In this small case series, recent traumatic fracture did not appear to be associated with any significant complication or worsened outcome. Therefore, the presence of a traumatic fracture should not be considered an absolute exclusion to therapeutic stroke thrombolysis.

FAMILIAR MOYAMOYA WITH ATYPICAL SYSTEMIC MALFORMATIONS

H.J.S. Nzwalo, V. Santos, F. Ferreira, C. Mendonça
Neurology Service, Faro Hospital, EPE, Faro, PORTUGAL

Background: Moyamoya is a rare chronic neurovascular disease that predisposes to stroke. Environmental and genetic etiological factors are still to be clarified, particularly in Caucasians. We report a case of two Portuguese sisters with moyamoya in association with unusual renal and intestinal malformations. Methods: Description of clinical, neuroradiological and laboratory findings of two
4 Interesting and challenging cases

Othello syndrome after cerebrovascular infarction
S.G. Rocha, J.D. Pinho, C. Ferreira, A. Machado
Hospital of Braga, Braga, PORTUGAL

Background: Othello syndrome, or delusional jealousy, occurs both in idiopathic psychosis and in neurodegenerative diseases. It was rarely described after cerebral infarction. We present two cases of delusional jealousy after acute right middle cerebral artery ischemic stroke.

Clinical report: 1- A 65 years-old hypertensive man was seen for sudden-onset left homonymous hemianopia, and left hemiparesis. MRI revealed right temporo-parieto-insular infarction. Work up showed occlusion of the right internal carotid. One week later he started to accuse his wife of wanting to murder him, because she was having a relationship with one of their sons, insisting on a DNA test of his youngest daughter, as he believed she was daughter of the incestuous relationship. He was treated with fluvoxamine and chlorpromazine. At six month of follow-up, he maintains residual delusional activity, finding that «the phones are bugged». 2- A 69 years-old man, with vascular risk factors, was observed due to sudden-onset of euphoria, and left hemianopia and mild left hemiparesis. MRI revealed right temporo-parieto-insular infarction. Work up showed occlusion of the right internal carotid. One week later he started to accuse his wife of wanting to murder him, because she was having a relationship with one of their sons, insisting on a DNA test of his youngest daughter, as he believed she was daughter of the incestuous relationship. He was treated with fluvoxamine and chlorpromazine. At six month of follow-up, he maintains residual delusional activity, finding that «the phones are bugged».

Results: We present two sisters of non-consanguineous healthy parents and no family history of cerebrovascular disorders or malformations. Patient 1 (younger) presented at the age of 11 years, with a 6 month history of frequent falls and difficulty with fine motor movements of the right upper limb. Dystonic movements of the right hemibody were detected. Brain CT was normal. Angio-MRI revealed occlusion of the left anterior and middle cerebral arteries with a cloud-like flow in the territory of the middle cerebral artery. She was submitted to encephaloduroarteriosynangiosis and remains asymptomatic after 8 years. Patient 2 (older sister) was diagnosed at the age of 27 after the incidental finding of a non-acute parieto-occipital stroke on CT scan, performed for aggravation of chronic tension type headache after minor cranial trauma. Angio-MRI showed findings compatible with moyamoya, but surgical intervention was declined due to unfavorable neuroradiological features. Investigation revealed bilateral multiple renal cysts in patient 1 and an intestinal duplication cyst in patient 2. Various conditions associated with moyamoya including cranial irradiation, Down’s syndrome, Neurofibromatosis, Sickle cell disease, mitochondrial disease and thrombophilic states were excluded. Renal artery doppler and echocardiogram were normal. No mutation in the RNF213 gene was found.

Conclusion: Descriptions of familiar cases of moyamoya among Caucasians are scarce. Our cases suggest a recessive moyamoya disease, associated with a combination of malformations not previously described in the literature.
started to be jealous of his wife, thinking that she was involved with other patients on his board. Over the following weeks he started accusing his wife to be sexually involved with his oldest son. He was treated with sertraline and quetiapine, with resolution of the delusional activity in 4 months. Both patients were right-handed and had no personal or family history of psychiatric illness.

Discussion: There appears to be no specific location for jealousy delusions, but frontal, posterior parietal, striatal and thalamic lesions have been implicated. These uncommon cases represent acute psychosis due to acute vascular events. They share in common right temporo-parietal lesions and seem to have a reasonable response to antipsychotics and selective serotonin reuptake inhibitors.

5 Interesting and challenging cases

Multiple microbleeds and recurrent lacunar and cardioembolic ischemic stroke in a woman with Fabry disease
P. Nencini, I. Romani, W. Borsini, D. Inzitari
Stroke Unit and Neurology, Careggi Hospital University of Florence, Florence, ITALY

Background: Fabry disease (FD) is an X-linked inherited deficiency of the lysosomal enzyme α-galactosidase A, which causes progressive lipid deposition in many cell types including the vascular endothelium of brain, heart, kidney, and skin. FD is suspected mainly in young male suffering cryptogenic ischemic stroke. The impact of FD in heterozygous females and in hemorrhagic stroke is less defined.

Case report: A 64-year old woman with a point mutation of GLA gene (R301P) and low leukocyte α-galactosidase A (13.5 nmol/mg/hour) had 3 recurrent ischemic strokes. Minor stroke due to pons lacunar infarction occurred at the age of 55; at this time hyperhomocysteinemia and hypertrophic cardiomyopathy in the absence of hypertension were found, and the patient started aspirin and vitamins. Reversible right hemiparesis recurred at the age of 58, when an ischemic lesion of left corona radiata and diffuse white matter lesions were shown by MRI. Ticlopidine and enzyme replacement therapy (agalsidase alpha, 0.2 mg/kg) were started. At the age of 64, she presented a new severe ischemic stroke in the middle cerebral artery territory. At this time cardiologic investigations showed progression of the cardiomyopathy and atrial fibrillation. Before starting oral anticoagulants, a T2*-weighted MRI was performed and multiple cerebral microbleeds, probably expression of small-vessel involvement, were documented in cerebellum, brainstem, thalamus, temporal, and frontal lobes. To reduce hemorrhagic risk, anticoagulation was avoided and the patient pursued antiplatelet treatment.

Conclusions: In FD, ischemic stroke may be related to small-vessel disease or cardioembolism. FD should be considered in ischemic stroke patients disregarding the gender and not only in cryptogenic stroke subtype. Therapeutic choices in FD with leukoaraiosis, multiple microbleeds, lacunar infarction and atrial fibrillation remain challenging.
Prevalence of Microembolic Signals in Patients with symptomatic intracranial arterial stenosis: a multicenter Transcranial Doppler Study.

Department of Neurology, Democritus University of Thrace, School of Medicine, Alexandroupolis, GREECE

Background & Purpose: TCD can reliably detect in real-time asymptomatic microembolic signals (MES) in cerebral circulation that are associated with higher risk of recurrent stroke and early neurological deterioration in patients with acute cerebral ischemia (ACI). There are limited data regarding MES prevalence in patients with symptomatic intracranial arterial stenosis (SIAS). We sought to evaluate the prevalence of MES in consecutive patients admitted with symptoms of ACI due to SIAS.

Subjects & Methods: Consecutive patients with ACI were prospectively evaluated with TCD over a 24-month-period. The previously validated criteria of SONIA trial were used for detection of >50% intracranial stenosis with TCD. Brain angiography was performed to confirm the diagnosis in cases with abnormal TCD findings. SIAS was diagnosed when there was evidence of a cerebral infarction in the territory of the stenotic artery (identified by TCD and confirmed by MRA/CTA). All SIAS patients underwent TCD-monitoring for a 30-min period for MES detection. MES were identified using the International Consensus Criteria.

Results: A total of 467 consecutive patients with ACI (60.4% men, mean age 58±14 years) were evaluated. SIAS was documented in 43 patients (9.2%; 95%CI:6.9%-12.2%). The most common SIA location was M1MCA (34.9%) followed by TICA (18.8%). MES were detected in 8 SIAS cases (18.6%; 95%CI: 8.4%-33.4%). The prevalence of diabetes mellitus was higher in MES (+) patients with SIAS in comparison to MES (-) SIAS cases (88% vs. 13%; p=0.021 by Fisher’s exact). The two groups did not differ in terms of baseline characteristics and other vascular risk factors.

Conclusions: Our findings indicate that MES were identified in almost one fifth of patients with ACI due to SIAS. Diabetes mellitus appear to be the only factor associated with higher likelihood of MES in patients with symptomatic intracranial atherosclerosis.

7 Vascular imaging

Predicting Carotid Plaque Characteristics by using Quantitative Colour-Coded Non-Gated Magnetic Resonance Plaque Imaging: Correlation with Carotid Endarterectomy Specimens

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Background: MR plaque imaging may be used to predict embolic complications during carotid endarterectomy (CEA) and carotid artery stenting. A non-gated T1-weighted (T1W) spin-echo (SE) technique was introduced to improve and stabilize intraplaque contrast in the presence of appropriate scanning conditions. We sought to characterize the distribution of various intraplaque components by using quantitative colour-coded maps generated from the non-gated T1W images and by correlating the histological findings of specimens excised by CEA.

Methods: We prospectively examined 40 consecutive patients who underwent CEA (age, 59–82 years; mean age, 69.5 years) by using a 1.5-T scanner (Echelon, Hitachi). Axial T1W SE images with TR of 500 ms were obtained using a self-navigated radial scan for motion correction. Colour-coded maps of the intraplaque components (i.e. fibrous tissue, lipid/necrosis, and haemorrhage) were generated. The percent areas of these components were automatically calculated using a software package (Plaque Viewer, Hitachi) and by applying previously reported cut-off values. We also measured the percent areas of these components on the histological specimens.

Results: Colour-coded maps of the carotid plaques visually corresponded well to the histological findings. The percent areas of the fibrous, lipid/necrosis, and haemorrhagic components were 9.6–97.9% (median, 40.0%), 2.1–53.8% (24.0%), and 0–69.8% (26.3%), respectively; whereas these components in the CEA specimens were 4.8–92.3% (24.6%), 7.0–93.8% (33.8%), and 0–70.4% (29.5%), respectively. Significant positive correlations were observed between the percent areas of these components in colour-coded maps and in the specimens (r = 0.83, 0.65, and 0.76, respectively).

Conclusion: Quantitative colour-coded maps based on non-gated T1W SE images can readily predict the composition of carotid plaques.

8 Vascular imaging

Comparison Of Four-dimensional Ct Angiography (4d-cta) With Mra In Acute Ischemic Stroke Patients With Probable Internal Carotid Artery Occlusion

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Conclusion
In an acute stroke setting, 4D-CTA can provide more accurate information of the affected ICA which is absolutely not visualized in MRA.

9 Vascular imaging

Diagnostic value of high resolution 3-tesla MRI in isolated MCA steno-occlusive disease: Intracranial atherosclerosis vs. Moyamoya disease
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Background
Isolated steno-occlusive disease in the middle cerebral artery (MCAD) is one of major causes of cerebral infarction in Asian. The main pathomechanism of the MCAD is atherosclerosis, but non-atherosclerotic vasculopathy, such as moyamoya disease or cerebral arterial dissection should be considered in some patients. The aim of this study was to evaluate the pathophysiology of isolated MCAD using high-resolution MRI (HR-MRI).

Method
We prospectively recruited patients who (1) were admitted in department of neurology at Asan Medical Center from October 2010 to November 2011; (2) had an ischemic stroke caused by MCAD; (3) aged less than 60 years; and (4) had no evidence of significant steno-occlusion in other cerebral arteries. Included patients underwent 3-Tesla HR-MRI for MCAD, and were classified into patients with eccentric stenosis (Eccen-
tric group) or concentric stenosis (Concentric group), according to patterns of sagittal images perpendicular to M1 segment of MCA.

Result

Among thirty-nine patients (age 28-60, mean 44.5), 27 patients (Eccentric group, 69%) showed an eccentric narrowing on HR-MRI and twelve patients (Concentric group, 31%) had a concentric stenosis of MCA. Baseline characteristics including sex, age and vascular risk factors were not different between two groups. Eccentric group has a focal eccentric wall thickness with enhancement more frequently (p<0.001), and had higher levels of LDL-cholesterol, homocysteine, and intima-media thickness than concentric group (p=0.01, p=0.01, p=0.035), suggesting atherosclerosis. In contrast, concentric group had a diffuse wall thickening without enhancement and smaller diameter of MCA lumen (p<0.001), suggesting non-atherosclerosis.

Conclusions

HR-MRI may be helpful to clarify the pathomechanism in MCAD. Non-atherosclerotic MCAD is not uncommon in Asians. Further studies are required to establish the sensitivity and specificity of this imaging technique.

10 Vascular imaging

Persistently Reduced Venous Drainage After Intravenous Thrombolysis is Associated With Poor outcome in Acute Anterior Circulation Ischemic Stroke


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Background- Rates and extent of recovery after intravenous tissue plasminogen activator (IV-TPA) for acute ischemic stroke (AIS) remain variable. Therefore, early identification of reliable predictors for functional outcomes is important for planning rehabilitation strategies. We hypothesized that venous drainage would be impaired on the side of cerebral hypoperfusion due to acute occlusion of internal carotid (ICA) or middle cerebral artery (MCA). The 2 internal cerebral veins (ICV) drain the deep parts of brain and run backward to form great cerebral vein. Since ICVs are consistently seen on CT angiography (CTA), parallel and run close to each other, even minor asymmetry in their filling can be easily diagnosed. Since ICV asymmetry in pre-TPA CTA can change in patients achieving arterial recanalization, we evaluated whether the presence of ICV asymmetry on follow-up CTA can predict the final outcome.

Methods- Data from consecutive AIS patients treated with IV-TPA from Jan2007 to March2010 were included in a prospective registry. ICV asymmetry was assessed by 2 independent stroke neurologists/ neuroradiologists, blinded to patient data or outcomes. Functional outcomes were assessed by modified Rankin Scale (mRS) at 3months, dichotomized as good outcome (mRS 0-1) and poor outcome (mRS 2-6). Data were analyzed for the early predictors of function outcome.
Background and purpose: Atherosclerotic lesions, such as atherosclerotic plaque, in major intracranial arteries are one of the main causes of ischemic stroke. Magnetic resonance angiography (MRA) is used to assess these lesions as luminal narrowing indirectly, but cannot visualize them directly. The MR 3D-VWI, a flow-sensitive 3D fast spin-echo technique obtained from T1-weighted isotropic volume images, is one of the promising method to visualize atherosclerotic lesions directly. The purpose of the present study is to visualize intracranial atherosclerotic changes in acute ischemic stroke patients using MR 3D-VWI.

Method: We prospectively examined 18 consecutive patients with acute non-cardioembolic stroke (10 in the middle cerebral arterial [MCA] territory, 8 in the vertebrobasilar arterial [VBA] territory) by using a 1.5T MRI. The thickening of the walls of the MCA and VBA detected by 3D-VWI suggesting of atherosclerotic plaques was evaluated. The contrast ratio (CR) of signal intensity of the lesions to the corpus callosum was calculated and compared among patients with MCA and VBA stenosis by

11 Vascular imaging

Detecting intracranial atherosclerotic lesions in acute ischemic stroke patients by using magnetic resonance three-dimensional vessel wall imaging (MR 3D-VWI)

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Results- Of the 2238 patients admitted with AIS, 226 (10.1%) with anterior circulation AIS received IV-TPA. Median age was 65yrs (range 19-92), 63% males and median National Institute of Health Stroke Scale (NIHSS) 16points (range 4-32). Hypertension was the commonest risk factor in 144 (76%) while 63 (33%) patients had atrial fibrillation (AF). Overall, 108 (47.8%) patients achieved poor functional outcome at 3months. ICV asymmetry could be assessed in 103 (45.5%) patients on their follow up CTA films. Admission NIHSS score (OR1.08;95%CI 1.001-1.157,p=0.048) and ICV asymmetry on follow-up CTA (OR 23.9;95%CI 5.15-63.99,p <0.0001) predicted poor outcome at 3months.

Conclusion- Asymmetry of internal cerebral veins on the follow up CT angiography after IV-TPA is an early predictor of poor functional outcome.
MRA. Results: Among 10 patients in the MCA territory, the wall thickenings of ipsilateral MCA suggesting of atherosclerotic plaque were observed in 9 patients (90%), and the hyperintense lesions (CR>0.5) in the plaque suggesting of intraplaque hemorrhage were observed in 7 patients (70%), while substantial stenosis of the corresponding arteries were detected in only 1 patient (10%) by MRA. Among 8 patients with VBA territory, the wall thickening were observed in all patients (100%), and the hyperintensity in 3 patients (38%), while no significant stenosis of the corresponding arteries were detected by MRA. Conclusions: The 3D-VWI is a novel and outstanding method to visualize the atherosclerotic lesions and may detect hemorrhagic lesion within plaque in the MCA and VBA among patients with acute ischemic stroke.

12 Vascular imaging

Agreement in the evaluation of middle cerebral artery recanalization using TICI criteria
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Background: Angiographic evaluation of cerebral artery recanalization is common primary endpoint in studies with endovascular recanalization in acute stroke patients. The aim of study was to compare evaluation of recanalization grade of middle cerebral artery (MCA) using Thrombolysis in Cerebral Infarction (TICI) criteria in patients indicated to mechanical endovascular recanalization.

Methods: Forty-two angiographic findings of acute stroke patients who underwent endovascular recanalization of the MCA occlusion were included to the study. Sagittal a coronal planes images and video loops of procedure of each subject were blinded and presented to two independent experienced
intervention radiologists for the evaluation of occlusion location before the procedure and recanalization grade at the end of procedure using TICI criteria. Cohen’s kappa and AC1 coefficient were assessed.

Results: Agreement in location of the occlusion was found in 76.2% cases (95% CI: 63.3-89.1), Cohen’s kappa=0.61 (95% CI: 0.42-0.80). Agreement in the evaluation of recanalization grade at the end of procedure was found in 50.0% cases (95% CI: 34.9-65.1), Cohen’s kappa=0.361 (95% CI: 0.171-0.551). Dichotomized, agreement in evaluation of complete versus none or partial recanalization was found in 97.6% cases, Cohen’s kappa=0.58 (95% CI: 0.28-0.88), AC1=0.785; agreement in evaluation of none recanalization versus partial or complete recanalization was found in 85.7% cases, Cohen’s kappa=0.79 (95% CI: 0.39 -1.00), AC1=0.973.

Conclusion: Evaluation of artery recanalization using the TICI criteria has poor interrater correlation when the whole scale grading is used. Nevertheless, the dichotomized results showed sufficient agreement for the evaluation in a common acute stroke care.

Supported by grant IGA MH CR NT/11386-5/2010 and NT/11046-6/2010

13 Vascular imaging

High Velocity of Basilar Artery Detected by TCD Indicates Co-existent Stenosis and Collateral Flow in patients with acute ischemic stroke.
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Background and purpose: There has been no study to investigate the hemodynamic change of basilar artery (BA) in patients with acute ischemic stroke. By evaluating artery stenosis by DSA, we aimed to investigate the clinical significance of increased systolic velocity in BA. Methods: We screened acute stroke patients in Guangdong Province Traditional Medicine Hospital and Prince of Wales Hospital between January 2008 and June 2011. Patients admitted within 7 days from stroke onset and with TCD and DSA performed were recruited, and systolic velocity ≥100cm/s of BA detected by TCD.

Results: Totally 92 acute stroke patients were recruited, with mean age of 66+/8 years and NIHSS of 0~18 (median 5). BA stenosis was in 29 patients (32%) detected by DSA. Among patients without BA stenosis, internal carotid artery (ICA) severe stenosis or occlusion were found in 23 cases (37%, 23/63), and vertebral artery (VA) severe stenosis or occlusion in 17 cases (27%, 17/63). Patients with both BA stenosis and ICA or VA severe stenosis had higher ac-
Background: Acute diffusion-weighted imaging (DWI) lesions are commonly considered markers of irreversible ischemia, although reports of its reversal challenge this view. DWI reversal has been recently reported as small and with little clinical relevance.

Objective: We assessed the prevalence of Reversible Acute DWI lesions (RAD) and relationships with clinical outcome in patients thrombolysed ≤4.5hrs of onset.

Methods: RAD was defined as acute DWI lesions not part of 24-hr DWI lesions, as determined visually or by voxel-based comparison of coregistered initial and 24-hr images. Accelerated velocity (176±45 cm/s) than patients with normal BA and BA normal co-existent ICA or VA severe stenosis (P<0.05, respectively). To evaluate the sensitivity and specificity of different velocity to diagnose BA ≥50% stenosis, values ≥120 cm/s, 140 cm/s, 160 cm/s, and 180 cm/s were used to plot ROC curve. The results showed that there was no proper cut-off velocity in TCD to diagnose BA stenosis (kappa<0.4, respectively).

Conclusions: Several conditions may contribute to increased velocity in BA, which makes the interpretation of BA hemodynamic changes very difficult. From our study, we found that increased velocity of BA was more frequent in BA normal but combing ICA or VA severe stenosis than BA stenosis. Moderate increased velocity (140 cm/s) may be due to compensate flow to ICA or VA severe stenosis or occlusion. High velocity in BA detected by TCD may indicate co-existent stenosis and collateral flow.

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Diffusion-weighted lesion reversal after thrombolysis: an MR correlate of early neurological improvement

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Background: Acute diffusion-weighted imaging (DWI) lesions are commonly considered markers of irreversible ischemia, although reports of its reversal challenge this view. DWI reversal has been recently reported as small and with little clinical relevance.

Objective: We assessed the prevalence of Reversible Acute DWI lesions (RAD) and relationships with clinical outcome in patients thrombolysed ≤= 4.5hrs of onset.

Methods: RAD was defined as acute DWI lesions not part of 24-hr DWI lesions, as determined visually or by voxel-based comparison of coregistered initial and 24-hr images.
Estimating site of arterial occlusion in subcortical stroke

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Background & Aim: Due to the small size of the arteries (third order branch occlusion and beyond) involved in lacunar stroke, documenting occlusion on angiography is rare in vivo. Recently, investigators have published microangiographic templates of arteries supplying the basal ganglia (lenticulostriate artery [LA] and recurrent artery of Heubner [RAH]). These templates display first (proximal) to third (distal) order branching of these arteries of the basal ganglia and can help with estimating the likely site of arterial occlusion and dimensions of third order occlusion.

Method: Cases were chosen from patients admitted to our institution from 2009 to 2011 with MRI. Scans were reviewed for the presence subcortical infarcts in the LA and RAH territories. These infarcts were manually segmented and linearly registered to a standard template using an affine transformation. These segmented infarcts were scaled and overlapped with published microangiographic templates. Five raters independently estimated the branching order of arterial occlusion using these templates.

Results: In 777 patients, there were 33 (58% male) patients with subcortical infarcts. The mean age was 63.1± 15.1 years. The regression model showed that infarct volume was associated with the branching order of these arteries (beta = -11.5 mm3 per change in branching order occlusion, 95% CI -18.9- -4.0). The regression model showed that infarct volume was associated with early neurological improvement (ENI=Delta NIHSS≥8 or NIHSS=0-2 at 24hrs) or excellent outcome (Modified Rankin Score ≤ 1 at discharge).
with the branching order of the small penetrating artery (beta = -9.1 ml per change in branching order occlusion, 95% CI -15.3- -2.9, p<0.01). For infarct height, the relationship with branching order of occlusion was beta = -14.6 mm per change in branching order occlusion, 95% CI -18.8- -10.3, P<0.01). Third order branch occlusion was associated with height 8.7± 4.1 mm, horizontal width 4.7 ±3.7 mm, anterior to posterior length 3.2 ± 2.2 mm.

Discussion: This study has provided a method for estimating of the type of infarcts associated with first order (proximal) to third order (distal ) occlusion of the LA and RAH.

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4D dynamic patient-specific modeling of ischemic stroke lesion evolution: From presentation to final damage using diffusion, perfusion and T2 MR imaging

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Diffusion (DWI) and perfusion-weighted (PWI) MR imaging may identify lesion core and at risk tissue but do not always predict its fate. Better characterisation of lesion spatio-temporal evolution through 4D dynamic models would clarify determinants of lesion evolution. Currently no such models exist for stroke.

We applied a 4D diffeomorphic dynamic current-based regression model to DWI and PWI data from acute stroke patients who had a single (ie not multifocal) lesion on DWI and PWI mean transit time (MTT) at 3 acute-subacute timepoints. We determined the spatial coherence between the estimated DWI/MTT 4D lesion boundary and the final T2-w image at >1month after stroke (dice index, 1.0=best; symmetric distance, 0 mm=best) and estimated the time point (in hrs from stroke) when the DWI/MTT lesion boundaries were spatially closest to the final T2 lesion.

In the 8 test patients, the estimated evolution scenarios fitted the DWI and MTT data well: dice index at the acquired timepoints for MTT (t2: 0.76+/-.09; t3: 0.8+/-0.08) and DWI (t2, t3: 0.9+/-0.02). The dice index for the 4D DWI and MTT lesion evolution vs final T2 lesion indicated wide inter-patient variation (DWI range 0.0008 to 0.77, median 0.58; MTT range 0.003 to 0.63, median 0.39) with similarly wide variation in the 4D symmetric distance for DWI 3.8 to 24.2, median 6.1mm and MTT 6.1 to 33.2, median 9.8 mm vs final T2. The time when DWI most closely matched final T2 lesion ranged from 6 to 237 hrs, median 138 hrs (MTT 9 to 270 hrs, median 78 hrs). 5 patients showed better, later in time geometric discrepancy of DWI than MTT with final T2 boundaries; 3 patients showed almost no DWI-MTT 4D lesion evolution overlap vs final T2 (mean dice index <0.05).
4D modeling of acute ischemic lesions reveals large inter-patient spatial-temporal variation in optimal agreement and 1st timing of DWI-PWI vs final T2 lesions. It also shows considerable promise for charting factors influencing ischemic stroke lesion evolution.

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Hyperintense vessels in acute stroke: clinical and MR-imaging characteristics in a large, multicenter patient group


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Background

Hyperintense vessels (HV) in Fluid-Attenuated Inversion Recovery (FLAIR) imaging of patients with acute ischemic stroke are assumed to reflect altered hemodynamics and compensatory collateral circulation. However, the exact pathophysiological mechanisms and clinical implications of HV in acute ischemic stroke are not yet clearly defined. We describe clinical and imaging characteristics according to the presence of HV in a large, multicentre group of stroke patients.

Methods

We analyzed data of 516 patients selected for final analysis in the previously published PREFLAIR study. Patients were studied by MRI within 12 hours of symptom onset. HV were defined as hyperintensities corresponding to a typical arterial course that were not considered the main occluded vessel ipsilateral to the diffusion restriction. Presence of HV was rated by two observers and consensus reached in cases of missing agreement. Clinical and MR-imaging characteristics were compared according to the presence of HV.

Results

Presence of HV was identified in 242 of all 516 patients (47%) with a high inter-
rater agreement (kappa = 0.885). Patients with detectable HV showed larger initial ischemic lesion volumes (mean 11.7 (95% CI 9.8-14.2) vs 4.9 ml (3.9-6.1); p<0.001) and a more severe clinical impairment (mean NIHSS 11 (9.7-11.6) vs. 7 (6.5-7.8); p<0.001). Additionally, HV were less likely found in patients with lacunar strokes caused by small vessel occlusion compared to other stroke aetiologies (9% vs. 49%; p = 0.001 for TOAST categories). There was also a difference in frequency of HV occurring significantly less often with strokes affecting both hemispheres (14% vs. 48%; p = 0.002) as compared to the right or left side. Time from symptom onset to MRI and the extent of leukoaraiosis were not related to the presence of HV.

Conclusion
In this large and representative group of acute stroke patients the presence of HV was related to larger and more severe strokes resulting from territorial infarction. Unlike parenchymal FLAIR hyperintensities HV are not a function of time from symptom onset.

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Global brain ischemia-reperfusion induces striatal T1-hyperintensity of neuronal death without erythrocyte-extravasation in human brains: SWI study on cardiac arrest survivors.

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Background:
Global brain ischemia-reperfusion leads to selective neuronal death in the hippocampal CA1 area, cerebellar cortex, dorsolateral striatum, and/or neocortical layers 3, 5, and 6 in animal models and in humans. Our previous MRI studies on patients resuscitated from cardiac arrest showed 1) bilateral neurodegeneration with hyperintensity on T1-weighted MRI in the striatum, thalamus, and/or substantia nigra (Stroke. 1994;25:2091-5., Neuroradiology. 1994;36:605-7.), and 2) specific hippocampal atrophy in the chronic stage (MRI volumetry) (Cerebrovascular Dis. 2000;10:2-7.). In the current study with susceptibility-weighted MRI (SWMRI), we investigated if the delayed T1-hyperintensity in the dorsolateral striatum consistently observed in cardiac arrest survivors represents minor hemorrhage (methemoglobin) or signifies selective neuronal death without bleeding reported as a specific type of ischemic neurodegeneration (Ann Neurol. 2003;54:732-47.).

Methods:
We repeatedly studied eight vegetative patients resuscitated from unexpected out-of-hospital cardiac arrest using magnetic resonance (MR) imaging. We performed SWI study on the late-onset striatal T1-hyperintensity to investigate if the specific change represents iron accumulation derived from hemoglobin degradation products.

Results:
In the eight patients, serial MR images
demonstrated delayed T1-hyperintensity in the bilateral striatum from one to two weeks after the onset. The SWI study showed no hypointense change in the striatal T1-hyperintensity.

Conclusion: The SWI study in patients after cardiopulmonary resuscitation suggests that global brain ischemia-reperfusion induces delayed striatal injury with T1-hyperintensity without erythrocyte-extravasation in humans.

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CAVEATS WHEN USING THE ACUTE CT PERFUSION-DERIVED CEREBRAL BLOOD VOLUME LESION TO HELP GUIDE THROMBOLYSIS TREATMENT

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Background: CBV defects larger than final infarct volumes from non-contrast CT (NCCT) or MR imaging have been reported, suggesting reversibility of such defects. To properly characterize impending infarction with CT perfusion (CTP) cerebral blood volume (CBV), and guide tPA administration, we need to consider 1) the possible overestimation of the CBV abnormality (CBVa) caused by the incomplete (truncated) contrast wash-out phase of the tissue time-attenuation curve (TAC), and 2) variable states of reactive hyperemia post-stroke.

Methods: Twenty-two patients had a CTP/NCCT scan within 6 hours and at 24 hours, 7 days and 3 months post stroke. At each time point the CBVAs was outlined. When no CBVA was present, the final infarct, defined using the 3 month NCCT, was superimposed onto the CBV map. Each CTP study was examined for truncation of the tissue TAC, defined as: the ratio of the increase in Hounsfield Unit (HU) value at the end of the CTP acquisition relative to that of the peak HU above baseline.

Results: For all patients, the CBVA volume (mean±stdev) at admission, 24 hours, 7 days and 3 months was 496.4±38.4cm³, 413.2±34.7cm³, 302.9±18.7cm³ and 719±33cm³, respectively. The 3 month CBVA was significantly higher (p<0.05) than all other time points. Mean CBVA volume difference between admission and 3 months was 10.2cm³ (range -28.5cm³ to 88cm³). For patients whose CBVAs decreased at 3 months (6/22), the mean TAC truncation difference from onset to 3 months was 22.7% versus 11.3% (p<0.05) for the 16/22 patients whose CBVAs increased in size. Reactive hyperemia was present in 16/22 at 24 hours and/or 7 days.

Conclusion: Using the admission CBVAs to quantify infarct core is useful if the tissue
TAC has minimal truncation-overestimation of the acute infarct core may exclude patients from receiving tPA. Furthermore, caution must be exercised when using the CBV_{VA} to define infarct core due to reactive hyperemia.

20 Brain imaging

Application of principal component analysis to evaluate topography of hypoxic-ischemic brain injury

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Background & Aim: The regions at risk of ischemia following cardio-respiratory arrest have not been systematically analysed. This knowledge may be of use in determining the mechanism of ischemic injury at vulnerable sites.

Method: The inclusion criteria were: age \( \geq 17 \) years, cardio-respiratory arrest and a coma on admission (2003-2011). Ischemic
injury was manually segmented on fluid attenuated inversion recovery (FLAIR) and diffusion weighted (DWI) sequences and linearly registered into common stereotaxic coordinate space. Topography of ischemic injury was assessed using digital probabilistic method (frequency data) and principal component analysis (covariance data). Next we performed a sensitivity analysis by sequentially removing patients who did not died.

Results: Forty one patients were included in this series (mean age ± SD = 51.5 ± 18.9 years). In our digital atlas, the highest frequency of ischemic injury on the DWI and FLAIR sequences was putamen (0.250), caudate (0.225), temporal lobes (0.0175), occipital (0.0150) and hippocampus (0.125). The first 6 principal components contained 78% of the variance of the data. The first component showed covariance between the deep gray matter nuclei and posterior cortical structures (contains 50.2% of the variance of the data). The sensitivity analysis showed that the pattern of ischemic injury was not changed when the analysis was restricted to patients who died.

Conclusion: We have described the patterns of hypoxic ischemic brain injury using two different approaches. The two different methods show similarity in their emphasis on the deep gray matter nuclei and the posterior cortical structures.

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Comparative 5-year Ischemic Stroke Risk between Transient Global Amnesia and Transient Ischemic Attack: a Population-Based Follow-up Study

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Background Although transient global amnesia (TGA) was a result of transient ischemia in memory relevant structure, the subsequent risk of ischemic stroke after TGA had not been studied in the Asian population. In this study, we aimed to compare the 5-year risk of ischemic stroke between TGA and transient ischemic attack (TIA).

Methods Using the whole-population claims data of National Health Insurance Research Database (NHIRD), we identified hospitalized patients with discharge diagnosis of TGA and TIA (International Classification of Disease, 9th edition, [ICD-9] code: 4377 and 435, respectively). A one-year baseline period before TGA or TIA admission was defined and patients with any diagnosis of cerebrovascular disease (ICD-9 code: 430-438) within the baseline period were excluded. Comorbidities including hypertension, diabetes, hyperlipidemia, coronary heart disease, and cardiac arrhythmia were identified within this baseline period. We followed the patients for 5-year and the event of interest was hospitalization due to ischemic stroke. Cox proportional hazard model was used to compared the risk of subsequent ischemic stroke between the TGA and TIA group during the 5-year follow-up period.
Results  We identified 647 and 74,896 patients with TGA and TIA, respectively. Of the patients, 5 (0.8%) from the TGA group and 9,244 (12.3%) from the TIA group had ischemic strokes during the follow-up period (P<0.001). After adjusting for those major risk factors of ischemic stroke, the TGA group still had decreased risk of ischemic stroke compared with the TIA group (hazard ratio, 0.10, 95% confidence interval, 0.04-0.24, p<0.001).

Conclusion TGA patients had smaller risk of subsequent ischemic stroke in 5 years of follow-up, compared with TIA patients. The finding was consistent with that reported in the western literature.

Etiology of stroke and risk factors

Depression and the risk for ischemic stroke and TIA – insights from the INVADE-trial

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Background A close relationship between depression and cardiovascular events is supposed during the last decade. It has been shown in the Framingham study, that the risk might be age-related, as there was an elevated risk of stroke in depressed people younger than 65 but not among over 65 years. The aim of this study is to investi-
gate whether depressive symptoms increase the risk of ischemic stroke/TIA in elderly subgroups. Methods In this post-hoc analysis of the INV ADE-project (intervention project on cerebrovascular diseases and dementia in the district of Ebersberg) - all subjects were included who performed a baseline Geriatric Depression scale (GDS) (n=3861), the follow up period was 6 years. Multivariate Cox-PH models adjusted for age, sex, BMI, smoking, hypertension, diabetes, alcohol abuse, hyperlipidemia, previous myocardial infarction, previous TIA, previous stroke, history of atrial fibrillation and physical activity were conducted for separate age groups (55 to 64 years and >65 years). Results In the age-group 55 to 64 (n=1669), in which 268 subjects (16.1%) were considered depressed, 37 events (stroke or TIA) were observed, whereas in the group > 65 years (n=2192) of whom 452 patients (20.7%) were depressed 184 events were recognized. The multivariate analysis showed a significant higher stroke/TIA risk in patients under the age of 65 years who had a GDS≥5 or antidepressant intake (p<0.009, hazard ratio: 2.598, CI (95%): 1.263 to 5.344) at the time of inclusion. Above the age of 65 years no significant association was seen. Conclusion This study suggests that depression plays a role as a risk factor for ischemic stroke and has to be considered especially under the age of 65 years. That the association was not seen above the age of 65 years might be explained by a predominance of other risk factors in these patients. Whether effective antidepressive treatment could influence the stroke risk in subgroups of patients could be a target of further investigations.

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Contribution of Genetic Variants Associated with Blood Pressure in Risk of Stroke Depending on Stroke Subtype. The Spanish Genetic Stroke Consortium (Genestroke).


Background: Hypertension (HTN) is the most important modifiable risk factor for stroke. Recent genome-wide association studies have identified novel genetic loci associated with BP. We sought to analyze how these loci may be associated to risk of different stroke etiological subtypes.

Methods: We analyzed 777 Caucasian individuals with stroke (206 Cardioembolic, 247 Atherotrombotic, 324 Lacunar) from 5 different Spanish hospitals, matched by age and sex with 986 controls. Demographic data and vascular risk factors were recorded for each individual. A total of 27 SNPs previously associated with Blood Pressure were genotyped. After quality controls, we included 19 SNPs in a Genetic Risk Score (GRS) created by the addition of every present risk allele.

Results: None of the single genetic variants was associated with stroke, any stroke subtype nor even with Hypertension. The GRS showed a trend to be higher in stroke patients than in controls, but the scores were significantly different for each stroke subtypes, being clearly significant for lacunar strokes (Cardioembolic: 14.82, p=0.74; Atherotrombotic 15.05, p=0.31; Lacunar:15.29; p=0.007). GRS was also significantly associated with hypertension (p=0.001).

Conclusions: The genetic component of blood pressure contributes to a higher risk of lacunar strokes, but not to other stroke subtypes. To gather additive effects of single variants in genetic scores provides a better indication of genetic risk.

INHERITED THROMBOPHILIAS IN CRYPTOGENIC STROKE PATIENTS UNDER 55 YEARS OLD

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Background and purpose: inherited thrombophilias cause venous thrombotic events; however their association with brain ischemia in adult patients is controversial. Our objective was to study the association between thrombophilia and cryptogenic ischemic stroke (CIS), as well as thrombophilia plus patent foramen ovale (PFO) and CIS, in stroke patients under 55 years of age.

Methods: Prospective observational study of consecutive patients under 55 years of age who experienced ischemic stroke (brain infarction or transient ischemic attack). Patients with CIS were compared with patients who had ischemic stroke of known cause (ISKC). We examined the presence of thrombophilia (Factor V Leiden and prothrombin G20210A gene mutations; deficiencies in protein S, protein C and antithrombin levels; resistance to activated protein C) and patent foramen ovale (PFO) in all patients.

Results: Two hundred fifty-four patients were included, 108 with CIS and 146 controls patients with ISKC of known cause. Patients with cryptogenic brain ischemia were younger (mean age 42.4 vs. 45.6 years old, p=0.002). The frequency of thrombophilia was significantly higher among CIS patients than among those with ISKC (22.2% vs. 6.5%, p<0.001). Furthermore, the frequency of PFO and PFO plus thrombophilia was higher among CIS patients than among those with ISKC (35.2% vs. 12.3% for PFO and 8.3% vs. 0% for PFO + thrombophilia, p<0.001). Multivariate analysis adjusted for confounding factors showed that the presence of thrombophilia was independently associated with CIS (OR 3.95; 95% CI, 1.70 – 9.13; p=0.001).

Conclusion: The data suggest an association between thrombophilia and CIS in patients under 55 years of age. Furthermore, systemic thrombophilic disorders could be involved in paradoxical embolism in this patient group.

Etiology of stroke and risk factors

Low ankle-brachial index predicts 5-year mortality but not recurrent stroke in patients with acute first-ever ischemic stroke

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Background and objective: Ankle-brachial blood pressure Index (ABI) lower is a clinical tool to identify the presence of peripheral artery disease (PAD) in both symptomatic and asymptomatic patients. There is a scarcity of data associating ABI with outcome in patients with ischemic stroke. We assessed the impact of ABI on 5-year outcome in patients with first-ever acute ischemic stroke.

Methods and results: ABI was assessed in a total of 653 consecutive patients with a first-ever acute ischemic stroke and follow for a period up to 6 years. One-hundred twenty nine (19.8%) stroke patients with ABI<0.9 were identified. Atheroclerotic stroke (lacunar, larger-vessel disease and cryptogenic) was the most frequent type of stroke diagnosed both in the whole cohort (64.7%) and in low ABI patients (65.1%). There was no difference in 5-year risk of stroke recurrence or composite cardiovascular events between patients with and without identified PAD. Survival was better in stroke patients with normal ABI (log rank chi2 23.35, p<0.001). The probability of 5-year survival was 49.3% (95%CI: 45.4-53.2) for low ABI patients and 56.5% (95%CI: 55.2-53.2) for normal ABI patients. On multivariate Cox-regression analysis, independent predictors of 5-year mortality included age (hazard ratio, HR 1.10, 95%CI 1.06-1.13, p<0.001), NIH stroke scale (HR 1.12, 95%CI 1.22-1.085, p<0.001), and low ABI (HR, 2.22, 95%CI 1.22-4.03, p=0.009).

Conclusions: Five-year mortality is increased in stroke patients with low ABI. ABI does not appear to predict long-term stroke recurrence or the risk of future cardiovascular events.

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Risk factors for ischaemic cerebrovascular events in young adults in the Stroke in Young Fabry Patients (sifap1) study


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European cohort of young patients with an acute ischaemic cerebrovascular event, modifiable risk factors were highly prevalent, particularly in men and in older patients. These data emphasize the need for vigorous primary and secondary prevention measures also among the young populations targeting the main traditional modifiable vascular risk factors.

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Usefulness of High Resolution MRI in Evaluating Basilar Artery Plaques in Acute Ischemic Strokes

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Background: Intracranial atherosclerosis (ICAS) is one of the major causes of ischemic stroke which is relatively neglected in Caucasians. Vessel wall imaging with high resolution magnetic resonance imaging (HRMRI) may provide more accurate information about intracranial arteries.

Methods: The patients with acute ischemic stroke underwent conventional MRI, MR angiography and proton-density weighted
HRMRI within 48 hours of admission. According to HRMRI, basilar artery plaque was categorized into 3 groups: no plaque, minimal plaque and apparent plaque. The demographic factors and risk factors were compared among the groups and the degree of stenosis which is calculated by MRA and HRMRI were also compared. Factors potentially associated with basilar artery apparent plaque was validated by multivariable logistic regression analysis.

Results: Of total 219 patients, minimal plaque was detected in 72 patients and apparent plaque 62 patients. Patients with apparent plaque showed higher frequencies of diabetes mellitus, low levels of high-density lipoprotein and higher levels of hemoglobin A1c, erythrocyte sedimentation rate and homocysteine. Of the 62 apparent plaques, severe stenosis (>50%) was observed in 10 (16%) by MRA and 27 (43%) by HRMRI which represents generally underestimation of MRA. After adjusting for covariates, the basilar artery apparent plaque was strongly associated with old age (OR, 1.051; 95% CI 1.010-1.094), diabetes mellitus (OR, 2.954; 95% CI 1.334-6.542) and high levels of homocysteine (OR, 1.090; 95% CI 1.024-1.171).

Conclusion: Basilar artery stenosis with plaque was more frequently observed by HRMRI and associated risk factors were slightly different from previous report using luminal angiography. The use of HRMRI deserves more attention when evaluating ICAS.

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Carotid Intima Media Thickness and Triglycerides in Patients with Acute Ischemic Stroke

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Background: Common carotid artery-intima media thickness (CCA-IMT) is an established marker of atherosclerosis. High triglyceride levels (TGs), especially post-prandial, have been suggested to be an indicator of ischemic stroke risk. However, the association between TGs and CCA-IMT remains controversial. We examined the relationship between CCA-IMT and TGs in acute ischemic stroke patients.

Methods: All patients who participated in the Berlin “Cream&Sugar” study between January 2009 and October 2010 and underwent carotid ultrasound studies were included. A combined oral triglyceride tolerance (OTTT)/oral glucose tolerance test (OGTT) (250ml of 32% cream followed by 75 g glucose) was performed 3 to 7 days after first ischemic stroke. Venous blood samples were collected at 0h (fasting), 3h, 4h, and 5h post-challenge. Subjects were classified according the pattern of TG response: (1) patients reaching a maximum TG before 5h post challenge (fast metabolizer, n=57) and (2) patients with increasing TGs until 5h post challenge (slow metabolizer, n=26). CCA-IMT was measured with B-mode ultrasound (on the far wall of the common carotid artery in a region free of plaques in a longitudinal image along a minimum of 10
stroke patients (brain infarction/TIA) treated in a Stroke Centre (June 2010-February 2011). A first 24-hours ECG Holter monitoring was performed if PAF was suspected and, if it was negative, a second 24-hours ECG Holter monitoring was performed. Variables analyzed: demographic data, vascular risk factors, stroke severity and etiological subtype, presence of carotid plaques by duplex ultrasound, enlarged left atrial by transthoracic/transesophageal echocardiography and presence of chronic/acute brain infarctions by neuroimaging (CT/MRI).

RESULTS: 219 patients included, mean age 69.8 (SD 13.5) years, 55.3% male. 17.8% have previous atrial fibrillation (AF). In 14 (6.4%) patients AF was diagnosed by ECG on admission or by serial ECG in the Stroke Unit. In 101 patients a 24-hours ECG Holter was performed, 85 cases during hospitalization and 16 in the outpatient clinic, to assess the presence of PAF. This 24-hours ECG Holter diagnosed PAF in 28.7% (29/101) of patients. In 21 cryptogenic brain ischemia patients who presented palpitations a second 24-hours ECG Holter was performed in the outpatient clinic. The mean time from the first to the second Holter was 143.3 (SD 72.2) days. The second 24-hours ECG Holter detected PAF in 2 (9.5%) patients.

CONCLUSIONS: the second 24-hours ECG Holter monitoring in the outpatient clinic could detect PAF in almost 10% of patients with cryptogenic ischemic stroke.
Pre-morbid Statin Use Associated With Improved 90 Day Survival Following Intracerebral Haemorrhage

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Background: Intracerebral haemorrhage (ICH) is associated with high morbidity and mortality and there are currently no proven treatments to improve outcomes. Evidence from animal studies suggests that statins may have a neuroprotective effect, but observational studies of the effect of pre-morbid statin use on ICH outcomes have given inconsistent results.

Methods: Data from 500 consecutive patients with ICH presenting to St George’s Hospital Stroke Unit from October 2003 to November 2011 were used to compare outcomes in statin users versus non-users. Independent predictors of 90-day case fatality were determined using logistic regression analysis.

Results: Of 500 patients (mean age 70, 55% male) with ICH, 132 (26%) were taking statins at stroke onset. Compared to non-users, statin users were older, more likely to be taking antiplatelet drugs or warfarin prior to stroke, and have pre-existing ischaemic heart disease or atrial fibrillation (p<0.01), which themselves were independent predictors of 90-day case fatality. After adjustment for these confounding factors, statin use was an independent predictor for survival to 90 days (OR 2.0, 95% CI 1.2-3.5, p=0.012). This effect was independent of total cholesterol levels measured at stroke onset.

Conclusion: Pre-morbid statin use is associated with improved survival to 90 days following ICH. Further research into the mechanism behind this effect is needed.

Thrombophilia and stroke: is there a causal relationship? A study of 393 young patients.

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Objectives: To analyse the causal relationship between thrombophilia and ischaemic stroke (arterial and venous) in patients under 50 years of age in our area.

Material and methods: We performed a retrospective study using BADISEN, a prospective database, of 523 patients under 50 years consecutively admitted to our hospital between 1996 and 2010. Of these patients, 393 had been diagnosed with transient ischaemic attack (TIA), cerebral infarct or cerebral venous thrombosis (CVT). A statistical analysis was performed using the SPSS software programme including vascular risk factors, aetiology, presence of a prothrombotic state, stroke recurrence, and presence of patent foramen ovale (PFO).

Results: 66.9% of the patients were male and the most frequent vascular risk factors were smoking and arterial hypertension. The most common presentation was cerebral infarct (80.6%), followed by TIA (16.2%) and CVT (3.1%). The most frequent aetiology was cryptogenic stroke.
Methods: Between October 2008 and June 2011, 30 adult patients (60 cerebral hemispheres, mean age of 45±25 years, and 73.3% female) who were diagnosed with moyamoya disease or syndrome at an University Hospital. Moyamoya staging for each hemisphere was graded according to the Suzuki’s criteria. Leptomeningeal, posterior communicating artery, and transdural collateral flows were investigated on cerebral angiography including internal carotid artery (ICA), external carotid artery (ECA), and vertebral arteries (VA). The location and lesion volume of ipsilateral infarction were analyzed on MRI. Flow volumes were measured using color-coded duplex sonography.

Results: ICA flow volumes were inversely correlated with the Suzuki’s grade (p<0.001), but ECA (p=0.783) and VA (p=0.628) flow volumes were not. Locations of the lesions (anterior vs. posterior, cortical vs. subcortical) were not significantly associated with Suzuki’s grade. As compared with (n=10) or without (n=26) transdural collateral in high-grade patients (3 or above), those with transdural flow had no neurological deterioration or fluctuation (30.8 vs 0.0%, p=0.047), smaller lesion volume (27.6±59.3 vs 2.4±3.6cc, p=0.041), lower ICA flow (p=0.022), and higher ECA flow (p=0.046) and the volume ratio of ECA to ICA (p=0.024).

Conclusion: The present study suggests that ICA flow volume had an inverse correlation with Suzuki’s grading, while the flow volume ratio of ECA to ICA appears to be associated with transdural collateral flow which can be a protector of impending in-
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Relationship between single nucleotide polymorphisms of SNP87 in Phosphodiesterase 4D gene and ischemic stroke in Han and Uygur patients in Xinjiang

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Background: To investigate the gene polymorphism of single nucleotide (SNP) 87 site of Phosphodiesterase 4D (PDE4D) gene in Uygur and Han patients with ischemic stroke in Xinjiang district. Methods: The gene polymorphism of SNP87 site of PDE4D gene of 226 patients with ischemic stroke (case group, 110 cases of Uygur, 116 cases of Han) and 220 patients without neurological disease (control group, 102 cases of Uygur, 118 cases of Han) were detected by PCR restriction fragment length polymorphism (PCR-RFLP) and gene sequencing method. The genotype and allele frequency of all the group were compared with each other. Results: There was no significantly different of genotypes of PDE4D gene SNP87 site between the case group and the control group. The C allele frequency in case group was significantly higher than that in control group (P<0.05). The CC genotype and C allele frequency in Uygur subgroup of case group were obviously higher than that in Uygur group of case group (all P<0.05). In the case group, there was no significant difference of PDE4D gene SNP87 site genotypes and allele frequency between Uygur subgroup and Han subgroup. And in the control group, there was no significant difference of PDE4D gene SNP87 site genotypes and allele frequency between Uygur subgroup and Han subgroup. Conclusions: The increase of C allele frequency of PDE4D gene SNP87 site may increase the risk of ischemic stroke. And the risk is not different between Uygur and Han population in Xijiang district.

【Key words】: Phosphodiesterase 4D gene; single-nucleotide polymorphism, ischemic stroke

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Time-trends in patient characteristics treated upon acute stroke units: Results from the Austrian Stroke Unit Registry 2003 - 2011

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Background: Changes in demography, increased awareness of vascular risk factors, better diagnostic instruments, progress in medical care and increasing primary stroke prevention influence the profile of patients admitted to stroke units. Changes in patient population and stroke type have important consequences on outcome and management
Etiology of stroke and risk factors

The association between nocturnal blood pressure patterns and cervical atherosclerosis in patients with a recent TIA or ischemic stroke.

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Background
Non-dipping nocturnal blood pressure patterns are often present in patients with TIA or ischemic stroke, and potentially a risk factor for recurrent stroke and other cardiovascular events. We aimed to assess the association between nocturnal blood pressure patterns and cervical atherosclerosis in patients with a TIA or ischemic stroke.

Methods
We performed 24-hour ambulatory blood pressure measurements in 236 consecutive patients with TIA or ischemic stroke. Dipping percentages were calculated as (daytime mean arterial pressure (MAP) – nighttime MAP)/(daytime MAP)*100. Extreme dipping was defined as >=20% dipping, normal dipping as >=10 and <20%, non-dipping as >=0 and <10% and reverse dipping as <0%. All patients underwent CT-angiography of the supra-aortic arteries.

Results: Data of 48,038 ischemic and 5,088 hemorrhagic strokes were analysed. Between 2003 and 2011, median age increased significantly for ischemic strokes from 68 to 71 years in men and from 76 to 78 years in women, respectively. Similar trends were observed for hemorrhagic strokes and for first-ever strokes. In ischemic stroke patients significantly increased rates were observed for hypertension, hypercholesterolemia, atrial fibrillation and other cardiac diseases than myocardial infarction. In hemorrhagic strokes an increase for hypercholesterolemia and cardiac diseases other than atrial fibrillation and myocardial infarction were only found in men. After correcting for age, these effects did not change. A small, but significant decrease in stroke severity was found for ischemic strokes from 4 to 3 points on the National Institute of Health Stroke Scale (NIHSS) in men and from 5 to 4 in women, and for hemorrhagic strokes from 9 to 6 points in men and from 9 to 7 in women. Ischemic strokes due to cardiac causes increased slightly, whereas macroangiopathy and hemodynamic causes decreased.

Conclusion: Significant time-trends were seen for characteristics of ischemic and hemorrhagic stroke patients admitted to acute stroke units in Austria. These include trends for older age and towards milder strokes. This signals a need for increased resources for managing multimorbidity and enabling early mobilization.
calcifications in the common carotid artery, internal carotid artery (ICA) and vertebral artery. The relation between blood pressure patterns and atherosclerosis was expressed as odds ratios. Adjustments for potential confounders were made with a multiple logistic regression model.

Results
A total of 97 patients (41%) were normal dippers, 19 (8%) extreme dippers, 99 (42%) non-dippers and 21 (9%) reverse dippers. Non-dippers and reverse dippers more often had a stenosis in the ICA than dippers and extreme dippers (43% and 52% versus 20% and 26%, p-value 0.001). Non-dipping and reverse dipping was significantly associated with stenosis in the ACI (aOR 2.5, 95% CI 1.3-5.0 resp. aOR 3.3, 95% CI 1.1-9.6). Non-dippers and reverse dippers also more often had calcifications in any of the scored arteries than dippers and extreme dippers (59% and 81% versus 42% and 42%, p-value 0.004). Reverse dipping was significantly associated with the presence of calcifications (aOR 5.8, 95% CI 1.4-23.7).

Conclusion
Non-dipping and reverse dipping nocturnal blood pressure patterns are independently associated with cervical atherosclerosis in patients with TIA or ischemic stroke.

36 Etiology of stroke and risk factors

ASSOCIATION OF OBESITY WITH CAROTID ARTERY INTIMA-MEDIA THICKNESS IN NON-DIABETIC MEN. INFLUENCE OF ADIPOCYTOKINES.

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Background: Obesity is a prevalent problem in developed countries, and a proved vascular risk factor. Carotid intima-media thickness (c-IMT) is a marker of early atherosclerosis and arterial remodeling and an independent predictor of stroke. The adipocytokines adiponectin and leptin have been suggested as risk factors for stroke, but conflicting results exist. The objective of our study is to determine if a relationship between obesity and c-IMT exists and if that relationship is mediated or not by adipocytokines.

Design/Methods: A consecutive sample of patients and relatives of a Nutrition consultation were included in the study after inform consent. Subjects with diabetes were excluded. Waist Circumference (WC), body-mass index (BMI) and c-IMT were determined in all subjects. We measured IMT in common carotid artery according to Mannheim consensus. Plasmatic levels of leptin, adiponectin, and HOMA index were also collected. Subjects were classified into normality, overweight and obesity depending on BMI values.

Results: 170 subjects were studied. Mean age 47 years (20-79), male 37.6%, hypertension 23%, hypercholesterolemia 22%, overweight 13.3%, obesity 55.2%, smokers 23%. In the bivariate study, WC was correlated to IMT (beta 0’003 p<0’01), but splitting the sample in both sexes, there were correlation only in the male group (beta 0’003 p 0’01). In the multivariate
heparin dose and timing, and patient factors were explored with data from the International Stroke Trial. This study was a factorial randomised controlled trial of subcutaneous heparin (given twice daily as 5,000 or 12,500 iu), aspirin (300 mg daily), both, or neither started within 48 hours and given for up to 14 days after acute ischaemic stroke. Of 19,435 randomised patients, 17,398 with CT-confirmed ischaemic stroke were included in the present analysis. Multiple variable analyses were adjusted for age, sex, severity (number of neurological impairments, 0-8), heparin dose, aspirin treatment and time to randomisation (surrogate for time to treatment).

Results: SICH occurred in 122 (0.7%) patients within 14 days of randomisation and peaked on day 1 post-randomisation. SICH was associated, in univariate analyses, with younger age (odds ratio, OR 0.98, 95% confidence intervals, CI 0.97-0.99), male sex (OR 1.52, 95% CI 1.05-2.20), severe stroke (OR 1.49 per impairment, 95% CI 1.29-1.71) and medium dose heparin (OR 4.93, 95% CI 3.20-7.61), and inversely with time to randomisation (OR 0.97, 95% CI 0.96-0.99). In multiple variable analysis, SICH remained associated with the same factors, in particular severe stroke (OR 1.49, 95% CI 1.29-1.72) and medium dose heparin (OR 4.97, 95% CI 3.22-7.67), and inversely with time to randomisation (OR 0.97, 95% CI 0.96-0.99).

Conclusion: The risk of SICH increased with severity of stroke, heparin dose and a short time from stroke to treatment. The potential risk of SICH with early anticoagulation should be considered if heparin therapy is required in patients with acute ischaemic
stroke.

38 Intracerebral/subarachnoid haemorrhage and venous diseases

Resolution of intraventricular hemorrhage varies by ventricular region and dose of intraventricular thrombolytic: the CLEAR IVH Program

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BACKGROUND The CLEAR-IVH program is assessing the efficacy of intraventricular recombinant tissue Plasminogen Activator (rtPA) for spontaneous intraventricular hemorrhage (IVH). This subanalysis assesses the effect of dose of rtPA by region on clearance of IVH.

METHODS Sixty-four patients within 12-24 hours of spontaneous IVH were randomized to placebo, 0.3mg, 1mg or 3mg of rtPA twice daily via an extraventricular drain. Twelve subregions of the ventricles were scored from 0-4. Effect of dose on IVH clearance to 50% (t50) of baseline score was compared by survival analysis for all regions combined and by subregion. Models including ventricular region, dose and baseline score were compared by Cox-Proportional Hazards.

RESULTS IVH score reduced faster across all regions with increasing rtPA dose (t50: log-rank p<0.0001; placebo-11.43 days, 95%CI 5.68-17.18; 0.3mg–3.19d, 1.00-5.38; 1mg–3.54d, 0.45-6.64; 3mg–2.59d, 1.72-3.46). In the combined models, dose and baseline score were independently associated with reduction in IVH score, which was quickest in the midline ventricles, then the anterior-lateral ventricles and slowest in posterior-lateral ventricles (t50: p<0.0001; rtPA dose: HR=1.47, 1.30-1.67; midline vs anterior-lateral HR=1.71, 1.08-2.71; midline vs posterior-lateral HR=4.05, 2.46-6.65; baseline score HR=0.96, 0.91-1.01), with a significant interaction between dose and ventricular region (p=0.005).

CONCLUSIONS rtPA accelerates resolution of intraventricular hemorrhage. This effect is dose-dependent, is greatest in the midline ventricles and least in the posterior-lateral ventricles.

Clinical Trial Registration: http://www.clinicaltrials.gov: NCT00650858.

39 Intracerebral/subarachnoid haemorrhage and venous diseases

Comparison of clinical and imaging characteristics of patients with primary intracerebral haemorrhage from different ethnic backgrounds: data from the Efficacy of Nitric Oxide in Stroke (ENOS) trial

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Background: Characteristics of patients with stroke vary by geographical world region, although data for patients with primary intracerebral haemorrhage (ICH) are limited.

Methods: We analysed clinical and brain imaging data on patients with primary ICH enrolled into the ongoing international ‘Efficacy of Nitric Oxide in Stroke’ (ENOS) trial of blood pressure management in acute stroke. Patients were categorised according to race-ethnicity: White (Australasia, Canada, Europe), South East Asia (China, Malaysia, Singapore), South Asia (India, Sri Lanka), and Africa (Egypt). ICH volume was measured using ABC/2. ICH and other brain features were categorised by neuroradiologists, using a structured rating tool, blind to clinical, ethnic and treatment data.

Results: Amongst 301 patients with neuroradiologically-confirmed ICH, non-white patients were younger; African patients were recruited earlier, had more severe stroke and more ICH-mass effect on scan; and patients from SE Asia had smaller ICH volume (Table). There were no significant differences in sex, baseline systolic BP, or presence of leukoariosis on brain scan.

Conclusion: Patients with ICH enrolled in a large international BP management trial vary geographically in their clinical and neuroimaging characteristics. Such differences, e.g. smaller ICH volume in patients from SE Asia, are potentially important in the design of trials to assess the effect of interventions, such as BP lowering, to manage acute ICH.

<table>
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<td>10 (50.0%)</td>
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<td>ABCD3+</td>
<td>3 (5.5%)</td>
<td>14 (23.3%)</td>
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<td>11 (64.5%)</td>
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<td>14 (82.4%)</td>
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<td>4 (23.5%)</td>
<td>&lt;0.001</td>
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<td>Fluctuations plus DWI and/or carotid stenosis</td>
<td>4 (23.3%)</td>
<td>13 (76.5%)</td>
<td>0.029</td>
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</table>

40 Intracerebral/subarachnoid haemorrhage and venous diseases

Prevalence of Atrial Fibrillation after Intracerebral Hemorrhage

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Background: Oral anticoagulation (OAC) with vitamin K antagonists is a highly effective preventive therapy of ischemic stroke.
stroke in patients suffering from atrial fibrillation (AF) and additional risk factors. The management of patients with AF and previous intracerebral hemorrhage (ICH) is challenging because the risk of thromboembolic events must be balanced against the risk of another ICH. To estimate the epidemiological size of this problem we determined the prevalence of AF in patients suffering an acute ICH.

Methods: Consecutive patients presenting in our neurological ER with a supratentorial or infratentorial ICH between August 2009 and February 2011 were included in our prospective study. Presence of AF was documented by 12-lead ECG, continuous ECG stroke unit monitoring, or by a telephone visit three months later. Age, gender, CHADS2-score, NIHSS, 3 months mortality and patients’ medication were recorded. Results: 207 ICH patients were eligible for the study. Mean age and NIHSS score at baseline were 71.0 +/- 12.4 and 15.8 +/- 12.2, respectively. Three months after ICH, AF had been diagnosed in 63 (30.4%) patients. 51 (24.6%) patients had already been treated with OAC before the ICH. In 41/51 (80.4%) the reason for anticoagulation was AF. Overall mortality after 3 months was 40.1% (83/207) but 54% in ICH patients with AF. Mean CHADS2-Score of the surviving 29 AF patients was 2.3 +/- 0.9. 23 (79.3%) of the surviving ICH patients with AF had an indication for OAC according to current guidelines (CHADS2-score>=2). However, only 5 patients (17.2%) were actually restarted on OAC.

Conclusion: AF is a very frequent comorbidity in patients suffering from ICH. Further studies are needed to establish the appropriate management in these patients.

41 Intracerebral/subarachnoid haemorrhage and venous diseases

Cerebral venous thrombosis in adults with acute lymphoblastic leukemia: a post-hoc analysis of the HOVON 37 ALL trial.
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Background. Venous thromboembolism (VTE) is a frequent complication in acute lymphoblastic leukemia (ALL). For reasons unknown, a large proportion of these VTEs are cerebral venous thromboses (CVT). We studied the incidence, clinical characteristics, timing in relation to therapy, and prognosis of CVT in adults with ALL.

Methods. Post-hoc analysis among patients included in the HOVON (Haemato Oncology Foundation, the Netherlands) -37 ALL study, a multicentre, prospective, randomized trial that ran between April 1999 and November 2005. All thrombotic complications were recorded prospectively. From patients diagnosed with CVT we extracted clinical parameters from the hospital records.

Results. Of 240 patients, 9 developed CVT (3.8%). The superior sagittal sinus was thrombosed in 8 out of 9 patients. Seven patients had parenchymal lesions and 2 patients had significant mass effect. Two patients died in the acute phase due to
characterisation of hyperdense signals on ACT or by post-contrast CT studies. However, little information has been published as to whether MRI is able to provide more detailed information regarding CE. The aim of this study is to compare the performance of MRI with that of ACT in the detection of CE and to study whether MRI improves the capacity of ACT to predict HG and outcome of patients with acute intracerebral haemorrhage (ICH).

Methods: We prospectively studied 34 patients with a primary ICH within 12 hours of symptom onset. CE was evaluated on the baseline ACT and on the MRI in post-contrast T1 sequences. CE was classified on MRI as one of 4 different patterns: central (A), peripheral (B), mixed (C) or absent (D). Early neurological deterioration (END) was assessed during the first 72 hours and HG was defined as a volume increase >33% between the baseline and follow-up CT. We analysed the sensitivity (S), specificity (E), positive (PPV) and negative predictive value (NPV) of ACT and MRI in predicting HG and END.

Results: CE was detected in 26.5% of patients on the ACT and in 47.1% on the MRI. The presence of CE on the MRI and ACT was significantly associated with haematoma growth and END. This association remains significant in the multivariate analysis after adjusting for age and hematoma volume. The S, E, PPV and NPV of the ACT in predicting HG and END were 60%, 90.9%, 86.8% and 69.4% and 58.3%, 90.9%, 86.4% and 68.5% respectively.

The S, E, PPV and NPV of the MRI in predicting HG and END were...
The role of cerebral atrophy in spontaneous supratentorial ICH

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Background: In spontaneous ICH, hematoma and edema create an immediate and continuous mass effect. Therefore, brain volume and size of the CSF spaces may have an impact on the course and outcome of the disease.

Methods: We reviewed the initial CT scans of 841 patients with spontaneous ICH who were included in a prospective multicenter clinical trial. Patients were randomized to receive either placebo or hemostatic medication. After excluding all patients with infratentorial bleedings, a threshold-based semiautomatic segmentation was used to assess the supratentorial brain volume as well as the corresponding skull content, yielding a brain-to-skull ratio (BSR). Furthermore, we assessed initial ICH volume and growth, as well as occurrence and amount of intraventricular hemorrhage (IVH). Glasgow coma scale (GCS) on admission and the modified Rankin scale (mRs) after 90 days were recorded. A logistic regression analysis was performed to identify independent risk factors for unfavourable outcome defined as mRs >2.

Results: 320 patients with supratentorial ICH with an initial CT of sufficient quality to perform segmentation analysis were included in the present study. Mean age was 65 years and median mRs after 90 days was 3. The BSR showed a strong significant correlation with patients age (r=-0.674; p<0.001) and both, BSR and age correlated significantly with the 90-day mRs (r=-0.287; p<0.001 and r=0.268; p<0.001, respectively). The odds ratio for unfavourable outcome at 90 days with the BSR was (OR 0.91; CI 0.84 – 0.99; p=0.03). The other parameters tested showed the expected Odds. The different study arms were distributed evenly among the present collective and had no influence on the outcome in the regression analysis.

Conclusions: We found reduced brain volume to be a novel independent risk factor for unfavourable outcome after spontaneous ICH. This likely reflects a negative impact of premorbid cerebral damage, e.g. due to neurodegenerative disease.
Global gene expression profiles in peripheral blood cells in aneurysmal subarachnoid hemorrhage

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BACKGROUND: Molecular mechanism underlying the systemic response to subarachnoid hemorrhage (SAH) are poorly understood. So far, most studies were focused on pre-defined presumably important pathways. The main aim of the study was to characterize a systemic response to SAH from a ruptured intracranial aneurysm (IA) analyzing gene expression profiles in peripheral blood.

METHODS: Peripheral blood samples were collected from n=43 adult patients with ruptured IAs and n=18 adult control subjects without IAs. Within the first 72 hours after SAH onset blood was obtained from 27 patients. Gene expression profiling was performed using a microarray method. Quantitative reverse-transcription polymerase chain reaction was used as a confirmatory test for some of the differentially expressed genes. Functional analysis of differentially expressed gene was performed to determine over-represented ontological groups.

RESULTS: There were 189 differentially expressed genes in SAH patients comparing with controls (p<0.05, Bonferroni correction): 144 were downregulated and 45 were upregulated. The most impacted biological processes were: immune system response, activation of T lymphocytes, and protein synthesis. In particular, transcripts related to lymphocytes’ subpopulations were downregulated, whereas those related to monocytes and neutrophils were upregulated in SAH patients. Genomic profiles of ruptured IAs were similar between early (first 72 hours) and delayed (> 72 hours) SAH phase.

CONCLUSIONS: Our results indicate that the rupture of IAs strongly influences the transcription profiles of peripheral blood cells. A specific pattern of these expression changes was found suggesting a depression of lymphocytes response concomitantly with an enhancement of monocytes and neutrophiles activity. These could underlie an immunodepression observed in SAH victims.
Building capacity for stroke services in rural locations: the effectiveness of Stroke Care Coordinators (SSCs) in Australia.


New South Wales Agency for Clinical Innovation, Sydney, AUSTRALIA1, National Stroke Research Institute, Melbourne, AUSTRALIA2, Rankin Park Day Centre, Newcastle, AUSTRALIA3, Monash University, Melbourne, AUSTRALIA4, Monash University, Melbourne, AUSTRALIA5, Wagga Wagga Base Hospital Wagga Wagga, AUSTRALIA6, John Hunter Hospital, Newcastle, AUSTRALIA7, Wagga Wagga Base Hospital Wagga Wagga Base Hospital, AUSTRALIA8, Port Macquarie Base Hospital, Port Macquarie, AUSTRALIA9, Tamworth Rural Referral Hospital, Tamworth, AUSTRALIA10, Armidale Hospital, Armidale, AUSTRALIA11, Western NSW Local Health Network, Orange, AUSTRALIA12, Shoalhaven & District Memorial Hospital, Nowra, AUSTRALIA13, Coffs Harbour Health Campus, Coffs Harbour, AUSTRALIA14, Armidale Hospital, Armidale, AUSTRALIA15

Background: In countries with a dispersed population it is difficult to ensure access to specialist services. The Rural Stroke Project was an initiative designed to enhance the provision of evidence-based stroke care in rural areas of New South Wales (NSW), Australia. A critical element was the funding of Rural Stroke Care Coordinators (Rural SCCs).

Aims: To describe the effectiveness of Rural SCCs for increasing access to evidence-based stroke care within and between service providers in geographically and administratively discrete regions.

Methods: Semi-structured clinician interviews and pre and post implementation clinical audits of medical records. Thematic analysis used for interview data. Descriptive statistics presented for comparisons of audit data.

Results: 96 health professionals completed 40 interviews across 8 health services. Among the 7 Rural SCCs, 4 were nurses. The appointment of Rural SCCs was reported to be the catalyst for achieving the majority of improvements in stroke care, including the establishment of stroke units. Almost all clinical indicators improved when audit data (pre n= 750; post n= 730) were compared (e.g. allied assessment within 24 hours pre 38% to post 60%). However, perceived variations in the organisation, available resources and functioning of the stroke services remained. Most changes occurred in the acute phase of care with little impact beyond the primary hospital site. Respondents believed that to extend the service enhancements to sub-acute and community settings there would need to be administrative and specialist nursing support, and further financial backing for service development for the Rural SCCs.

Conclusion: The funding of Rural SCCs has proven to be a major link in the chain of delivering improved stroke care in rural NSW. However, enhancements for sub acute and
community settings, and better links between large and small rural hospitals, are still needed. Other countries may benefit from implementing similar initiatives.

46 Heart and brain

Atherosclerotic Plaques in Carotid Arteries as a Marker of Plaques in Aorta in Patients with Stroke
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INTRODUCTION
Hypoechoic atherosclerotic plaques (AP) in the aorta are associated with cerebrovascular embolic events. Therefore, patients with stroke need to investigate the presence of plaques in the proximal aorta as an embolic source. The most frequently used test to detect these lesions is transesophageal echocardiography (TEE). However, this technique is not available in all services. Instead, the carotid ultrasound is a simple and worldwide available method.

OBJECTIVES
1- To correlate the presence of AP in carotid arteries and in proximal aorta; 2- To compare the AP morphology in the two vascular territories.

MATERIALS AND METHODS
Prospective transversal study including 80 consecutive patients of both sexes, hospitalized for stroke. All patients underwent carotid ultrasound and TEE in same day. The carotid plaques were classified as the echogenicity in four types: hypoechoic, predominantly hypoechoic, hyperechoic, and predominantly hyperechoic. The comparisons were performed using logistic and linear regressions. It was considered a significance level of p<0.05.

RESULTS
We evaluated 47 men and 33 women aged 65 ± 12.2 years. The presence of carotid plaque was predictive of plaque in the aorta (OR = 50.7, 95% CI: 12.6-203.6, p < 0.001) with an area under the ROC curve of 0.88, without influence of age. (OR = 1.04, 95% CI: 0.99-1.10, p = 0.13). There was a significant association between the plaques echogenicity in carotid artery and aorta ($R^2 = 0.55$, p < 0.001). The presence of hypoechoic AP in carotid artery increased the risk of hypoechoic AP in aorta (OR = 4.6, CI 95%: 1.4-15.1, p = 0.010).

CONCLUSION
Patients with stroke presenting AP in carotid artery have an elevated risk of plaque in the proximal aorta. Hypoechoic plaques in carotid are predictive of the same echogenicity in the proximal aorta.

47 Heart and brain

The incidence of first-ever Atrial fibrillation during 10-year follow-up after ischemic stroke in the Lund Stroke Register
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North-West Center for diagnostics and treatment arrhythmias, St-Petersburg, RUSSIAN FEDERATION¹, Lund University and Skåne University Hospital, Lund, SWEDEN², North-West Center for diagnostics and treatment arrhythmias, St-Pe-
Introduction: Atrial fibrillation (AF) is a risk factor for ischemic stroke (IS). However, whether IS indicates an increased risk for a new onset AF has not been fully clarified. We aimed to assess the incidence and risk factors associated with the new onset AF during long-term follow-up after first-ever IS.

Methods. First-ever IS patients (n=336, age 74±11 y, 200 men) enrolled in Lund Stroke Register from March 2001 to February 2002 were included and compared in a 1:1 fashion with age- and gender-matched control subjects without stroke history, recruited using the population register. AF history prior to admission and the date of new-onset AF during 10-year follow-up were assessed using medical records, an ECG database containing all ECGs from the hospital catchment area (7247 ECGs in total) and by record linkage with the Swedish National Discharge Register (SNDR).

Results: By enrolment, 29% of IS patients and 10% of controls had AF history (p<0.001). Among 542 subjects without AF at baseline, ECG review revealed new onset AF in 74 cases of which only 46 had AF diagnosis codes obtained via SNDR record linkage. In 8 patients with a SNDR AF diagnosis during follow-up, no ECG verifying this was detected. The number of ECG-verified new onset AF cases during follow-up did not differ between the groups: 38 (16%) stroke patients vs 36 (12%) controls, ns. In a multivariate analysis, new onset AF was associated only with age > 68 years (1st tertile, HR=3.2  95%CI 1.61-6.40, p=0.001), body weight > 81 kg (3rd tertile, HR=1.97 95%CI 1.16-3.33, p=0.012) and history of hypertension at inclusion (HR=1.82 95%CI 1.09-3.03, p=0.020).

Conclusions: In patients surviving first ever IS new onset AF during 10-years follow-up is associated with advanced age, increased body weight and history of hypertension while stroke per se is not predictive of AF occurrence. Data obtained from clinical patient registers, including discharge registers may significantly underestimate AF prevalence.

48 Experimental studies

Is the modulation of interactions between leukocytes and the vascular endothelium a part of statins neuroprotective effects?
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Stroke is a major public health issue against which there are only few therapeutics. Many processes intervene in the pathophysiology of cerebral ischemia, including inflammation, and play a crucial part in the development of long-term after-effects. HMG-CoA-reductase inhibitors (statins) exert neuroprotective effects resulting from their pleiotropic effects. Our aims were to assess the anti-inflammatory effect and the modulation of vascular wall-leukocytes interactions by a post-stroke statin treatment, and its benefits on functional recovery. C57BL6 mice were submitted to one-hour middle-cerebral artery occlusion (MCAO)
and treated orally by vehicle or atorvastatin (AT) (10 or 20mg/kg/d) for 72 hours. Functional recovery (neurological score, grip test, hanging wire test and adhesive removal test) was assessed every 24 hours after MCAO. Infarct size determination, immunohistochemical analysis of markers of leukocyte adhesion and tissular infiltration (ICAM-1, myeloperoxidase) and ex-vivo vasoreactivity were performed 72 hours after MCAO.

Acute treatment resulted in a 35% diminution of the infarct size in the mice treated with AT 20mg/kg/d (mean +/- SD: 28.93 +/- 11.64mm3 p<0.05) and in a 21% diminution with AT 10mg/kg/d (36.66 +/- 6.87mm3 NS) versus the vehicle-treated mice (39.70 +/- 9.82mm3). This was associated with a tendency towards a better functional recovery in treated mice. There were no modifications of the counts of cells expressing ICAM-1 and of parenchyma-infiltrated granulocytes. Acute treatment with AT provided a slight protection against post-ischemic endothelial dysfunction.

Our study shows a neuroprotective effect of atorvastatin when administered after MCAO in mouse. These preliminary results, showing apparently a lack of effect on leukocyte adhesion and infiltration and a modest endothelial protection, suggest that the modulation of the vascular wall-leukocyte interactions is not a major pathway involved in the neuroprotective effect of AT.
Results: We have found the mRNA expression levels of IL17, SERPINH, MMP9 to be upregulated in the symptomatic group when comparing with asymptomatic group (>3-Fold). We also have identified SIL1, RAB24 and HSP1A1 to be underexpressed in symptomatic plaques (p<0.01). From the 60 genes analysed, 21 genes showed a fold increased over 1.5 in symptomatic plaques and 5 genes were found to be have < -1.5 fold change compared with asymptomatic plaques.

Conclusions: We confirmed in this study several biomarkers already described in the literature and besides we have identified novel biomarkers that may be of relevance for prediction of plaque rupture and destabilization.

50 Experimental studies

Assessment of biochemical changes in a rat model of stroke by High Resolution Magic-Angle Spinning (HRMAS) magnetic resonance spectroscopy.

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Background: In vivo magnetic resonance spectroscopy (MRS) is a useful non invasive technique to study stroke in preclinical models. However, low spectral resolution may be a limiting factor for obtaining detailed metabolomic information. HRMAS is a sensitive technique for ex vivo studies. Nevertheless, tissue biochemical profile may be perturbed due to post-mortem ischaemia. The aim of this study has been to evaluate the use of focused microwave irradiation (FMW) for preventing post-mortem changes in brain tissue metabolome and performing ex vivo HRMAS data acquisition at physiological temperature.

Methods: Sprague-Dawley rats (n=3) were subjected to 90-minute transient right middle cerebral artery occlusion. At 24 hours after the ischemic onset, animals were sacrificed by FMW. Brains were dissected in samples from stroke and contralateral regions and HRMAS at 9.4T and 37°C was performed. Total Creatine (Cr) (3.03 ppm) normalized peak heights of chosen metabolites were used for analysis. Differences were assessed with Student’s t-test.

Results: Metabolism was properly arrested with FMW as shown by the remaining phosphocreatine (PCr), PCr/Cr (3.95/3.93 ppm) ratio: (0.59+/-0.13 and 0.71+/-0.25
Background: Phosphoinositide 3-kinase (PI3K) has recently been implicated in neuronal cell survival. We investigated the protective effects of direct PI3K activation in vitro and in vivo models of ischemic stroke.

Method: A PI3K activator was treated in primary cultured cortical neurons injured by hypoxia, viability was evaluated with MTT assay and CCK-8 assay, and western blotting and immunocytochemistry were performed. In addition, intravenous PI3K activator (24 μg/kg: most effective dose) was administered to 75 rats (PI3K activator group) and saline to another 75 (saline group) after a 2-h occlusion of the left middle cerebral artery. Brain diffusion-weighted MRI was performed after a 1-h occlusion and similar infarct sized rats are randomized to either PI3K activator group or saline group. Fluid attenuated MRI (FLAIR), neurobehavioral function tests and immunocytochemistry were also performed after 24 hours of occlusion. Results: The viability of primary cultured cortical neurons injured by hypoxia, viability was restored. The survival-related signals were increased and death-related signals were decreased in the PI3K activator group. The infarct volume measured by FLAIR MRI and TTC staining was decreased by around 20% and 29% in the PI3K activator group compared with the saline group. These protective effects were gained from a 48% reduction in the number of TUNEL-positive cells, decreased expression of activated caspase-3, cleaved poly ADP-ribose polymerase (PARP), COX-2 as well as an increase in heat shock transcription factor-1 expression. In addition, the number of apoptotic cells was significantly reduced in the PI3K activator group compared with the saline group. Conclusion: Increase in lactate agrees with the onset of anaerobic metabolism in compromised brain cells in stroke zones. The NAA decrease is related to neuronal function loss. The overall results agree in FMW animal sacrifice preventing post-mortem changes and helping to better characterize metabolomic information that could be extrapolated to in vivo studies.

51 Experimental studies

Role of Phosphoinositide 3-kinase in cerebral infarction
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Significant changes were detected between stroke and contralateral regions: i.e. an increase in lactate (1.33 ppm) of 6.06+/−2.5 fold change (p<0.01) and a decrease in N-acetylaspartate (NAA) (2.02 ppm) of 0.52+/−0.23 fold change (p=0.03) in stroke regions, which is consistent with published data for in vivo experiments.

Conclusion: Increase in lactate agrees with the onset of anaerobic metabolism in compromised brain cells in stroke zones. The NAA decrease is related to neuronal function loss. The overall results agree in FMW animal sacrifice preventing post-mortem changes and helping to better characterize metabolomic information that could be extrapolated to in vivo studies.
treatment with PI3K activator significantly restored neurobehavioral functions. Conclusion: These results suggest that PI3K plays very important roles in neuronal survival against acute ischemic stroke, and restores neurobehavioral functions. PI3K activation may reduces the infarct volume by reducing ischemic cell death, related inflammatory reaction, brain edema, and increasing survival signals.

52 Experimental studies

Expression of the Endocannabinoid receptors 1 in Human Stroke: an autoptic study

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Objective. The endocannabinoid system is up-regulated in several neurological diseases. One animal study demonstrated increased expression of the endocannabinoid receptor 1 (CB1) in the penumbra area surrounding the central ischemic core. Our aim was to evaluate the cerebral expression of CB1 receptors in the ischemic brain areas of 9 patients died between two days and one week after a first acute cerebral infarction in the middle cerebral artery territory. Methods. The cerebral autoptic tissue was collected for each subject within 24 hrs after death. Ischemic, perilesional and contralateral normal appearing areas were identified in each subject. After the usual tissue preprocessing, 2-µm-thick cerebral sections were incubated with the specific primary CB antibodies (Cayman Chemical Company). Thereafter, all cerebral sections were hematoxylin treated. For each section total cell number and total CB-positive cells were counted and, for each area in every subject, the CB-positive cell count ratio was calculated. Differences in CB expression between the ischemic and normal areas were evaluated using Student’s t-test. Results. In normal tissue, CB1-positive neurons were the large majority, whereas a few non-neuronal cells expressed CB1. In the ischemic areas, a few surviving neurons were detectable and showed a similar CB1-staining as the intact tissue; in the perilesional tissue, a significant increase of neuronal CB1 staining was found, in comparison to contralateral normal appearing regions. Moreover, in ischemic and perilesional areas, there was a significant increase of CB1-positive non-neuronal cells, in comparison to the intact regions. Conclusion. In line with previous animal studies, we found an increase of CB1 expression in ischemic and perilesional regions of the human brain, due to neuronal and non-neuronal cells (i.e. macrophages, microglia and astrocytes) staining, that may reflect the inflammatory reaction to...
Methods: Focal cerebral ischemia was induced in TASK2-/- and wild-type mice by transient middle cerebral artery occlusion (tMCAO). After 24 hours, neurological deficits were assessed and infarct volumes were quantified from histological brain sections. The expression of TASK2 and different proinflammatory cytokines in the ischemic brain was analyzed by immunohistochemistry and PCR. The cellular infiltrate was determined by flow cytometry. Results: In the ischemic brain TASK2 was expressed on neurons and infiltrating immune cells. 24h after tMCAO TASK2-/- mice developed significantly smaller brain infarctions (p<0.001) and less severe neurological deficits (p<0.05) compared with controls. mRNA levels of the proinflammatory cytokines IL-1-beta and TNF-alpha were significantly lower in the ischemic hemispheres of TASK2-deficient mice an observation which was paralleled by smaller numbers of infiltrating immune cells, i.e. neutrophils and macrophages.

Conclusion: Our findings demonstrate that TASK2 is an important player in the pathophysiology of acute ischemic stroke. Whether blocking of TASK2 acts beneficial in ischemic brain damage by directly inducing neuroprotection or the attenuation of the local inflammatory response (or both) is currently under investigation. This work was supported by the Else-Kröner-Fresenius Stiftung.
Detection and analysis of mesenchymal stem cells in rat brain after MCAO induced stroke

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Background: Mesenchymal stem cells (MSCs) are used in vitro as well as in clinical trials for cell therapy after stroke since they are easily accessible and transplantation is considered safe. Despite encouraging results still few is known about making homing of stem cells more efficient. Aim of this study was therefore to analyse stem cell homing efficiency, migration and viability in an animal model of stroke.

Methods: Adipose tissue derived human MSCs were labeled with MRI contrast agent containing fluorochrome labeled very small superparamagnetic iron oxide particles (VSOPs). Middle cerebral artery occlusion (MCAO) was induced in male Wistar rats by a nylon thread. Saline without (n = 5) or with 1x10⁶ MSCs (n = 7 animals) was injected post 90 min ischemia followed by reperfusion via the internal carotid artery. Infarct size and stem cell localisation was measured by 9.4 T MRI 48h and 9d after MCAO. Histological analysis (evaluation of MSC number, localization, viability and correlation with infarct size) was done 14d after MCAO by detecting auto fluorescence of the contrast medium and staining against, Prussian blue, human nuclei and fibronectin.

Results: MSCs could be visualized in the affected hemisphere as hypo-intensive dots in T2* weighted images in all treated animals 48h after MCAO as opposed to control animals. Signal changes after 9d indicate cell migration towards infarct area. MSCs could be detected by auto fluorescence of contrast medium, human nuclei and iron uptake. Fibronectin staining showed intact cell membranes. 95% of cells were localized in the affected hemisphere. Cell number evaluation revealed a good correlation with infarct size (R² = 0.85).

Conclusion: We detect homing of MSCs after stroke by 9.4 T MRI and by histological analysis. Cells seem to be alive and show active migration. The total number of cells attaining into brain correlates with infarct size.
at different times in an experimental animal model of cerebral infarct. Material and Methods: We used 60 Sprague Dawley male rats distributed into: - Healthy (12 rats); - Sham for 24h (12 rats) and 3 days (12 rats) and - Infarct for 24h (12 rats) and 3 days (12 rats). More than 40,000 genes were analyzed in tissue samples from the core and peri-infarct area obtained at 24h and 3 days after permanent middle cerebral artery occlusion (pMCAo) in rats. Results were analyzed using IPA software in contralateral and ipsilateral tissue samples of sham and healthy animals as controls. Results: The number of significantly regulated genes (fold change ≥ |1.5|; p<0.05) in the core after 24h and 3 days of pMCAO was of 2,612 and 5,717 genes respectively, compared to healthy animals. The total number of significantly regulated genes in the peri-infarct area was of 3,505 (24h) and 1,686 (3 days). Furthermore, the total number of differentially expressed genes comparing core and peri-infarct regions augmented with time, being of 202 at 24 hours but 1,165 just after 3 days of cerebral ischemia. Functional analysis showed that genes differentially regulated in all cases belonged to cell-to-cell signaling interaction, hypoxia response (HIF-1α), cellular development and growth (TGF-β), cell death and stress (HSP-70), as well as inflammatory response (IL-1R). There were not significant differences between sham and healthy animals (0 genes, 24h; 0 genes, 3 days). Conclusions: This study of gene expression provides evidences for a whole genetic background behind the differences existing between core and peri-infarct areas as well as brings useful information in order to identify new targets and develop new therapeutic strategies for the treatment of ischemic stroke.

57 Large clinical trials (RCTs)

The Quality in Acute Stroke Care (QASC) Trial: Processes of care associated with 90-day survival and independence

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The Quality in Acute Stroke Care Trial (QASC) is registered with the Australian New Zealand Clinical Trial Registry, number ACTRN12608000563369

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Background: The Quality in Acute Stroke Care Trial examined the effect of a behaviour change intervention to improve management of fever, hyperglycaemia and swallowing following acute stroke. We previously reported a 16% absolute improvement in 90-day death and dependency (>=2) for intervention acute stroke unit (ASU) patients with reductions also in mean temperature, mean glucose and improved swallow screening. We now examine process of care measures that predict better outcomes.

Method: Using the post-intervention cohort, we firstly examined univariate associations between 90-day survival and independence (mRS<1) and 5 processes of care: temperature monitoring; fever management; glucose monitoring; hyperglycaemia management; and dysphagia management. Next, using multiple logistic regression we determined which processes predicted survival and independence adjusting for baseline characteristics, treatment allocation, and clustering of patients within ASUs.

Results: Data were available for 971 patients, of whom 501 (51.6%) were alive and independent at 90-days. Process of care that predicted survival and independence were: measurement of venous blood glucose (VBG) within 2 hours of ASU admission (P=0.024); treatment of febrile event (>37.5°C) (P<0.001); and swallow screening and speech pathologist referral if indicated (P=0.001). Having VBG measured [OR (95% CI)=0.72 (0.54-0.95) P=0.026] and treatment of febrile event [OR=0.63 (0.42-0.97) P=0.013] remained statistically significant in a multiple logistic regression model adjusting for age, sex, diabetic status, treatment allocation, Barthel Index, stroke severity and baseline pre-morbid mRS; with swallow screening losing statistical significance [OR=0.80 (0.54-1.19) P=0.247].

Conclusion: Our results provide strong evidence for prompt measurement of blood glucose on admission and treatment of febrile events to improve stroke outcomes. Both should become part of evidence-base care for acute stroke patients.
trial, neurothrombectomy with SOLITAIRE compared with MERCI was superior in achieving the primary endpoint: successful recanalization without use of rescue therapy or symptomatic intracranial hemorrhage (SRNH). We performed subgroup and sensitivity analysis on the primary and secondary endpoints to further investigate the effects of treatment with SOLITAIRE versus MERCI.

Methods: Multicenter RCT with blinded primary endpoint ascertainment. Key entry criteria: age 22-85; NIHSS 8-29; within 8h of onset; ineligible or failed IV TPA; intracranial ICA, M1, M2, BA, or VA occlusion.

Results: The study population, enrolled at 18 sites, comprised 31 roll-in phase SOLITAIRE patients and 113 randomized patients, 58 SOLITAIRE, 55 MERCI. Among randomized patients, SOLITAIRE and MERCI treatment arms were comparable on 27 baseline demographic and medical history variables, including age, NIHSS, and onset to treatment time, though differed in atrial fibrillation, confusion at presentation, and past visual disturbance. Multivariate modeling identified as independent outcome predictors: SRNH - smoking and incoordination at presentation; 90d good neurologic outcome - age; 90d mortality - age and time to treatment. Subgroup analysis confirmed treatment benefit in patients in multiple subgroups, including atrial fibrillation: SRNH, 67% vs 25%, p=0.003; mortality 15% vs 54%, p=0.003; good neurologic outcome, 56% vs 18%, p=0.005. Sensitivity analysis confirmed benefit in the entire population after adjustment for all independent outcome predictors: SRNH, OR 5.8 (CI 2.4-14.1), p=0.001; mortality OR 0.3 (CI 0.1-0.7), p=0.008; good neurologic outcome, OR 3.0 (CI 1.3-6.9), p=0.01.

Conclusions: The SOLITAIRE Flow Restoration device is superior to the MERCI Retriever in achieving successful recanalization free of symptomatic hemorrhagic transformation, reduced mortality, and more frequent good neurologic outcomes across a broad range of subgroups.
Wednesday 23 May 2012
Poster Session Red, Nurses and AHP’s Poster Session

Chairs:
A. Algra, The Netherlands, N. Bornstein, Israel, P. Canhao, Portugal, G.R. de Freitas, Brazil, F. Fazekas, Austria, A. Gass, Germany, W.D. Heiss, Germany, I. Henriques, Portugal, R. Herzig, Czech Republic, M. Kaste, Finland, Y. Kooko, Japan, P. Langhorne, UK, P. Lindsberg, Finland, H. Markus, UK, A. Planas, Spain, K. Spengos, Greece, T. Tatlisumak, Finland, D. Toni, Italy, P.J. Touboul, France, R. Veltkamp, Germany, A. Verdelho, Portugal, D. Vivien, France, J. Wöhrle, Germany

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Vascular imaging---p.209
Brain imaging ---p.234
Etiology of stroke and risk factors ---p.266
Intracerebral/subarachnoid haemorrhage and venous diseases ---p.326
Management and economics ---p.361
Heart and brain ---p.373
Behavioral disorders and post-stroke dementia ---p.389
Experimental studies ---p.401
Vascular biology ---p.431
Meta-analysis and reviews ---p.440
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Poster Session Nurses/AHP’s ---p.463
59 Interesting and challenging cases

**Hypoperfusion encephalopathy in a patient with Moyamoya**

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**Background**

Moyamoya is a rare cause of stroke. It is a progressive cerebral vasculopathy, of unknown etiology, characterized by severe bilateral stenosis/occlusion of the main arteries of the circle of Willis, with a pattern of collateral vessels that look like a “puff of smoke” on angiography. The diagnosis peaks in two age groups, children approximately 5 years of age and adults in their mid-40s.

**Case report**

A 77-year-old male patient, with a long-standing history of uncontrolled hypertension, was admitted to our hospital with a left basal ganglia hemorrhage, extending into the ventricles and subarachnoid space. Antihypertensive therapy was started and the initial evolution was favorable. By day 14, facial and later multifocal myoclonus appeared, with decreased arousal, ensuing severe encephalopathy. At this point we excluded increased hemorrhage volume, hydrocephaly, nonconvulsive status epilepticus, infections, metabolic causes, and iatrogenesis. DWI MRI didn’t show ischemic lesions. Perfusion CT showed bi-hemispheric hypoperfusion - left fronto-parietal and right temporal and CT angiography severe bilateral ICA stenosis or occlusion, with compensation through posterior circulation and leptomeningeal collaterals. Moyamoya was suspected and confirmed by conventional angiography.

**Discussion**

We report this case because of the rarity of the Moyamoya diagnosis at this age and for the atypical presentation. The initial manifestation was interpreted as a hypertensive intracerebral hemorrhage. Later, when we detected hypoperfusion encephalopathy, Moyamoya was diagnosed. In this context, vasospasm and hipotension are both possible contributing factors to the hypoperfusion encephalopathy.

60 Interesting and challenging cases

``DWI-SWI`` mismatch may represent ischemic penumbra in acute stroke.


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**Background:**

Susceptibility-weighted MRI (SWI) has become widely used to investigate acute stroke pathophysiology (Neuroradiology 2012 in press). The paramagnetic property of deoxyhemoglobin induces SWI signal...
change related to intravascular spontaneous blood oxygen level dependent effect. Thus, SWI detects the increased ratio of deoxyhemoglobin to oxyhemoglobin in cerebral venous compartments, and is considered to illustrate cerebral misery perfusion (hypoperfusion with compensatory increase of oxygen extraction fraction). Here, we describe the neuroradiologically-illustrative case of acute stroke with ‘‘DWI-SWI’’ mismatch in the ischemic human brain.

Case Report:
A 54-year-old man suffered from speech disturbance after left neck compression by a machine tool. On arrival at a local hospital one hour later, neurological examination showed consciousness level of GCS14 without any other deficit. Brain CT scans revealed no abnormality. However, six hours after the injury, right hemiparesis developed. DWI study showed a laminar hyperintensity in a small portion of the left cerebral cortex. MRA revealed left internal carotid artery (ICA) occlusion 2cm distant to the carotid bifurcation. On admission at our hospital 8 hours after trauma, he showed GCS12, motor and sensory aphasia, and moderate right hemiparesis. The left cerebral angiography (DSA) showed an extension of the occlusion through to the ICA top. MRI study at 10 hours showed a smaller DWI-hyperintensity in the cerebral cortex and a larger area of prominent SWI-hypointense cerebral veins in the left hemisphere. The SWI-lesion exceeding DWI-hyperintensity matured into infarction 20 hours after trauma with neurological deterioration.

Conclusion:
The DWI-SWI mismatch may signify a discrepancy between smaller cytotoxic edema and larger misery perfusion, and provide information about viability of the brain tissue at risk of potential infarction.

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**Intracranial haemorrhage due to acquired haemophilia A associated to myasthenia gravis**

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**BACKGROUND AND PURPOSE**
Acquired haemophilia A (AHA) is a rare disease caused by an inhibitory antibody to factor VIII. Patients sometimes have intracranial haemorrhages (IH) as first manifestation. AHA is frequently associated with autoimmune entities. We present a patient who suffered an IH due to AHA, associated to myasthenia gravis, the first one as far as we know.

**PATIENT**
A seventy-one-year-old man, with hypertension and ocular MG diagnosed two years before, under treatment with prednisone, but nor antiplatelet neither anticoagulant treatment, reported headache, left hemiparesis and paresthesia, and left supranuclear facial palsy, with an evolution of 48 hours. After 24 hours of admission, he added somnolence, severe dysarthria and ocular deviation to previous symptomatology.

**RESULTS**
Blood pressure was normal at his arrival to emergency department. A cranial tomogra-
21. European Stroke Conference

Recurrent Cerebral Infarction in habitual Cannabis users.
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Background: Recurrent stroke associated with cannabis use only previously described in one single case report. Proposed mechanisms include vasculopathy, systemic hypotension, cardioembolism and alterations in cerebral blood flow. In recent years increasing availability of high strength herbal cannabis has been associated with an increase in associated health problems. We describe three cases of recurrent strokes in patients after repeatedly using cannabis following an initial stroke event.

Methods: Retrospective case series of three patients with recurrent strokes associated with cannabis use.

Results: Subjects 1 & 2 (34yrs F, 29yrs F) were admitted with recurrent cerebral infarction affecting multiple arterial territories over several months. No alternate cause for stroke could be found on repeated assessment for common cardiac, dylipidaemic, coagulopathic and genetic causes. Subject 1 also suffered arterial occlusion of her popliteal artery and renal infarcts and was found to have multiple areas of smooth arterial stenosis on ultrasound survey related to apparent intimal hyperplasia. Temporal Artery biopsy revealed intimal hyperplasia with layering of the cells suggestive of chronic irritation. Subject 2 also had evidence of vasculopathy on her carotid imaging. Subject 3, (64yrs M), had known long-standing Right Internal Artery occlusion and borderzone infarction and presented with subsequent complete occlusion of the Right Middle Cerebral Artery with consequent cerebral infarction. All three subjects had acute infarction confirmed on diffusion weighted imaging. All admitted to cannabis use within the 24hrs prior to admission and had recurrent strokes on recommencing cannabis use despite appropriate secondary treatment.

CONCLUSIONS
Intracranial haemorrhage could be the first manifestation of an AHA. It should be considered if there is prolonged aPTT, even more if it is associated to autoimmune disorders.
with no history of stroke was seen at our neurosonography lab for periodic TCD screening. At one visit TCD showed elevated flow velocities in the left intracranial carotid artery (ICA) and proximal middle cerebral artery (MCA), but normal velocities on the right side. MR-angiography delineated bilateral occlusive disease of the distal ICA and proximal MCA with a delayed perfusion in the left MCA territory on MR-perfusion imaging. Cerebral angiography (CAG) showed leptomeningeal anastomoses from the posterior and anterior cerebral artery and collateral perfusion by branches of the external carotid artery. Risk of left-hemisphere stroke was considered to be exceedingly high in this asymptomatic patient, and decision for direct revascularisation surgery was made. The procedure was performed without complications.

Conclusion: SCD patients with new elevated blood flow velocities on TCD, especially if asymmetrical, should be carefully evaluated for moyamoya syndrome, as treatment of the latter may differ from usual primary stroke prevention measures.

63 Interesting and challenging cases

A Patient with Sickle Cell Disease and Moyamoya Syndrome
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Background: Incidence of stroke is increased in patients with sickle cell disease (SCD), particularly in the homozygous form. Various stroke etiologies are postulated including hypercoagulability, red blood cell sludging in the microcirculation and large-artery occlusive disease. For primary prevention of stroke in children with SCD annual transcranial Doppler ultrasonography (TCD) screening is recommended with use of blood transfusion in those with elevated blood flow velocities (>200 cm/s mean flow). Moyamoya syndrome, a progressive stenosis of the intracranial internal carotid arteries and their proximal branches, is associated with SCD. This condition also leads to elevated intracranial blood flow velocities, but other treatment modalities than transfusion such as revascularisation surgery have to be considered.

Methods: Case report.
Results: A patient with homozygous SCD

64 Interesting and challenging cases

Posterior Reversible Encephalopathy Syndrome with Predominant Brainstem Involvement: a Case Report
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Background: Posterior reversible encephalopathy syndrome (PRES) comprises a characteristic clinical and radiographic pat-
Interesting and challenging cases

Acute myocardial infarction- is it a complication of intravenous thrombolysis for stroke?

Special hospital for cerebrovascular disease “Sveti Sava”, Belgrade, SERBIA

Background: Complications of intravenous (IV) thrombolysis with tissue plasminogen activator (tPA) are commonly related to haemorrhage or arterial re-occlusion, but also we recognized embolic complications.

Cases: We describe two cases of acute myocardial infarction (MI) in the first several hours following IV t-PA for acute stroke. A 77-year-old female presented to the emergency department with sudden onset of right sided weakness and global aphasia without any history of cardiac disease. Her baseline ECG was with no evidence of ischemia. CT brain scan revealed a hyperdense left middle cerebral artery. She was administered IV t-PA in usual dose at 180 minutes following the onset of stroke. Ten hours following the infusion of tPA she developed sudden breathlessness. Her blood pressure dropped to 80/50mmHg. ECG showed an acute inferolateral wall myocardial infarction. Troponin level was 28.4.

Another patient is an 81-year-old woman with the history of diabetes mellitus and hypertension presented to the ER with sudden onset of left hemiplegia and severe dysarthria. CT brain scan revealed old bilateral hemispheric lacunar infarcts. The patient received IV tPA 160 minutes after the

Conclusions: PRES can rarely present with limited infratentorial involvement and corresponding clinical signs.
stroke. Approximately three hours after the completion of tPA she developed sudden vomiting without chest pain. ECG revealed ST segment elevation in anterior leads and troponin was elevated to 4,88. Echocardiogram of both patients did not reveal any cardiac thrombus. The patients died before the arrangement for coronary angiography could be made.

Discussion: Acute myocardial infarction immediately following tPA treatment for stroke is a serious complication. We suspected that administration of IV tPA for stroke may lead to fragmentation and lysis of intracardial thrombus with subsequent embolisation to coronary arteries leading to MI but we could not prove that. Other possibility is simultaneous occurrence of two atherosclerotic event MI and stroke independent of each other.

66 Interesting and challenging cases

Lipoid Proteinosis and Spontaneous Intracerebral Haemorrhage A case report and review of the literature
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Introduction: We report the case of a Caucasian man with a prior diagnosis of lipoid proteinosis who presented with a primary intracerebral haemorrhage. Lipoid proteinosis is a rare autosomal recessive disease characterized by the deposition of hyaline material in the skin, mucosa, and viscera. Symptoms are present from early childhood and include skin thickening and hoarseness of voice. As far as we are aware, no cases of lipoid proteinosis have been reported suggesting an association with intracerebral haemorrhage.

Case Description: A 52 year old man was admitted with sudden onset of dysphasia and right face, arm and leg weakness. He was diagnosed with lipoid proteinosis since early childhood. He had no known risk factors for haemorrhagic stroke. General examination revealed mucosal thickening of the oral cavity and the presence of waxy and thickened skin of the face and hands. Neurologically there was a dense right sided hemiparesis and severe expressive and receptive dysphasia. Ambulatory blood pressure monitoring, 12 lead electrocardiogram and echocardiography did not reveal any evidence of hypertension. CT brain revealed left intracerebral haemorrhage. Intracranial CT angiography and magnetic resonance imaging (MRI) of the brain did not point to an underlying aetiological cause.

Discussion: To date only 300 cases have been reported world-wide. The disease follows a slowly progressive but benign course. Lipoid proteinosis has been linked to mutations in the gene encoding extracellular matrix protein 1 (ECM 1). One case report of gastrointestinal haemorrhage has shown evidence of deposition of hyaline in gastrointestinal tract. Intracranial haemorrhage has not been reported in lipoid proteinosis before. Deposition of hyaline material may possibly affect vascular integrity, however this needs further investigation.

Conclusion: This case demonstrates possible association between lipoid proteinosis and spontaneous primary intracerebral...
Interesting and challenging cases

**Treatment of acute ischaemic stroke during pregnancy- a first reported case of endovascular stenting**

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**Background**

Ischaemic stroke is a rare but catastrophic complication during pregnancy. There is limited data available on the safe use of intravenous thrombolysis. We present the first reported case of endovascular stenting during pregnancy for the treatment of acute ischaemic stroke.

**Methods**

A 37 year old female presented at 36 weeks gestation with sudden onset right sided hemiparesis and aphasia. She was assessed in the Emergency Department by the hyperacute stroke team. Her CT brain showed changes consistent with an evolving left middle cerebral artery infarct and thrombus was visible in the M1 segment on CTA. She was transferred immediately to the angiography suite for endovascular intervention. Her angiogram demonstrated a right supraclinoid carotid stenosis and near total occlusion of the left middle cerebral artery. A solitaire stent was inserted across the stenosis, chosen for its low rupture risk. Around 60% narrowing remained but with good distal perfusion. The total time from initial haemorrhage.

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**Figure 1. CT Head**

**Figure 2. Skin changes**
collapse at home to restoration of flow was under four hours.

Results
After routine observation on the Intensive Care Unit, the patient was transferred to the acute neurology ward. Examination 24 hours post procedure revealed full power in all limbs and fluent speech with only subtle naming difficulties. An MRI brain at this time demonstrated multiple areas of restricted diffusion in keeping with acute infarcts, predominantly affecting cortical areas in the left middle frontal gyrus, operculum and anterior aspect of the insular cortex. She was discharged home after 72 hours. A repeat MRI two months post event revealed minimal parenchymal damage. She delivered a healthy baby boy thirty eight days post procedure.

Conclusion
This case demonstrates the potential for successful treatment of ischaemic stroke during pregnancy using endovascular intervention and stenting following rapid assessment at a specialist centre. It represents the first reported case in the literature.

68 Interesting and challenging cases

**Traumatic injury of the vertebral artery as a cause of stroke**


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Background: Vertebral artery dissection is a recognized but underdiagnosed complication of trauma to the cervical spine. Injury of a vertebral artery can cause brain infarctions. There are two mechanisms contributing to the development of stroke symptoms: the accumulation of blood under the vessel wall, causing ischemia and the irregularities of the vessel wall that causes turbulence, raising the risk of thrombosis and embolism.

Clinical case: The authors present a case of an 87 year-old man, who was hit by a car. On hospital admission, the patient was fully conscious, presented no neurological symptoms and no arrhythmia on the ECG. Cervical CT image revealed a comminuted
fracture of the right transverse apophysis of C2. Cervical stabilization was performed by collar neck. Three days after, patient returned to hospital because of consciousness deterioration. Physical exam detected anisocoria (left>right), left ptosis, right hemiparesis and indifferent right plantar reflex. Vertebral artery dissection was considered and angiographic CT was performed, revealing absence of filling of the right vertebral artery above C3, returning complete at the intracranial V3/V4 transition, probably by retrograde flow. The patient was commenced on intravenous heparin.

Conclusion: When faced with a patient with stroke in the posterior territory and a recent history of cervical trauma, the diagnosis of vertebral artery dissection should be considered. The quick start of anticoagulant therapy decreases the risk of recurrent embolic event and improves the prognosis, but when patient has a recent major trauma this balance could be difficult to achieve.

69 Interesting and challenging cases

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Background: A 50 year old previously healthy male had serum positive Mycoplasma pneumoniae and Bordetella pertussis infections 3 months prior to presenting to his local ED with nausea, vertigo, and balance impairment. He was diagnosed with viral meningitis as an LP showed increased protein and WBC’s with negative cultures; a head CT was negative. He returned to the ED 6 days later with similar symptoms and a brain MRI/MRA was performed, which showed multiple nonenhancing, hyperdense lesions. The patient was transferred to our hospital and repeat MRI confirmed multiple acute infarctions in the right cerebellum and subacute infarcts in the right frontal lobe and left occipital-parietal lobe; MRA was negative for atherosclerosis. A thorough hypercoagulable and cardiac workup was unremarkable and no cerebrovascular risk factors were identified. He had a lower extremity deep venous thrombosis (DVT) diagnosed upon admission to our hospital, but an intracardiac shunt was ruled out. The most likely mechanism for our patient’s acute strokes is M. pneumoniae associated local vascular injury, as no other pathological mechanisms or risk factors were identified.

Methods: Case Report

Results: A review of the literature identified additional cases of cerebral infarctions of unknown etiology associated with infections of M. pneumonia. The theorized mechanism was endothelial vascular injury secondary to the infection. The patient improved neurologically and functionally with acute rehabilitation and was dismissed home functioning independently.

Conclusion: This patient may have had cerebral infarctions secondary to a respiratory infection with M. Pneumonia several months previously. However, further research is needed to understand the pathophysiology, diagnostic work up, and treatment options when M. pneumoniae as-
sociated stroke is clinically suspicious.

70 Interesting and challenging cases

Migrainous-like infarction with arterial vasospasm on CT-angiography: links with the reversible cerebral vasoconstriction syndrome
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Migrainous infarction is a rare complication of migraine. We report the observation of a patient who presented with cerebral infarction after typical visual aura, and whose arterial explorations clearly showed a local arterial spasm suggesting reversible cerebral vasoconstriction syndrome (RCVS).

Case report: A 22-year-old nurse with a past history of ophthalmic migraine presented with her characteristic aura in the left visual field followed by progressive left hemicorporal sensory dysfunction and weakness during one hour. No headache was observed during or after the symptoms. MRI performed one hour after symptoms revealed a left frontal hyperintense vessel sign on FLAIR sequence and a distal occlusion of the right cerebral middle artery (CMA) on 3D-TOF, with no infarction on the diffusion sequence. A couple of hours later, the transcranial Doppler study showed a decreased flow on right CMA. At Day 2, CT angiography showed a single regular intracranial stenosis at the site of the previous 3D-TOF abnormality. At Day 3, both transcranial Doppler and 3D-TOF were both normal. At that time, a small right insular infarction was revealed by the diffusion sequence of MRI. The patient remained asymptomatic during hospitalisation. Biological and cardiac investigations were all normal. No toxic or vasoconstrictor agent use was found.

Discussion and conclusion: Migrainous infarction was first discussed in our patient since initial complaints were mimicked the usual visual aura and because the sensory symptoms appeared progressively. Vasospasm was observed on the arterial workup, suggesting RCVS despite the absence of headache concomitantly to stroke. Migraine has been frequently reported in RCVS patients, but with no special role in the potential neurovascular complications. According to the present case, RCVS could be responsible for stroke in some patients with so-called migrainous infarction.

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The stroke that wasn’t - syndrome of headache with neurologic deficits and cerebrospinal fluid lymphocytosis mimicking acute ischemic stroke
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Background: The syndrome of transient headache and neurological deficits with cerebrospinal fluid lymphocytosis (HaNDL) is a benign condition that can mimic stroke. The syndrome consists of recurrent headaches, reversible neurological deficit
and lymphocytic cerebrospinal fluid (CSF) pleocytosis, with variable duration and spontaneous resolution. Although several etiopathogenic mechanisms have been suggested (vascular, infectious, immunological and calcium channelopathy), its aetiology remains unknown.

Case report: A 29 year old man was admitted in the Emergency Department for vomiting, speech disturbances and paresthesias in the right limbs which had started one hour before. He had no family history of neurological diseases nor relevant vascular risk factors. Upon admission he presented motor aphasia, right-sided homonymous hemianopsia, right hemiparesis and hemicpypoaesthesia. A brain CT scan was normal. Based on the clinical syndrome and available anamnesis, he was diagnosed with acute stroke and thrombolytic treatment with rtPA was performed. Two hours after treatment a fever (38.9 °C) was detected and the patient reported left hemicranial throbbing headache. Having improved from aphasia, he revealed that in the preceding days he had had two episodes of paresthesias in the left limbs and headache. CSF was collected, the analysis revealed 51 cells/μl (98% lymphocytes), protein 52.1 mg/dL and normal glucose. The patient was asymptomatic 14 hours after onset of symptoms. Microbiological studies of CSF and blood, brain MRI, Doppler ultrasound of cranial and cervical vessels were all normal. HaNDL syndrome was diagnosed. At 6 months follow-up, there has been no recurrence of symptoms.

Conclusion: With the current pressure on “door-to-needle” time for thrombolytic treatment, it is important to be aware of stroke mimics and exclude them, if possible, especially in atypical patients. Where available, perfusion/diffusion-weighted MRI may help.

72 Interesting and challenging cases

INTRAVENOUS THROMBOLYSIS IN BASILAR DISSECTION: REPORT OF A GOOD RECOVERY.
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BACKGROUND: Basilar dissection is a rare condition and in most cases the clinical presentation is of severe neurological dysfunction. Our aim is to show a basilar dissection with good recovery after thrombolysis.

CASE REPORT: A 33 year-old man, otherwise healthy patient was admitted to the emergency department where he arrived 3 hours before with dysarthria and right-sided hemiparesis (NIHSS:11). Vital signs and a cranial CT were normal at admission. The patient was considered eligible for intravenous thrombolysis and alteplase was initiated. Afterwards a progressive recovery of the neurological functions was observed (NIHSS: 4). But after one day, 3 new episodes of neurological compromise returned with the same features as initially, always followed by significant recovery. AngioCT and angiography demonstrated a complete and isolated dissection of the basilar artery, without subarachnoid hem-
Two Concurrent Neurological Complications as Initial Clinical Presentation of Enterococcus faecalis Infective Endocarditis.
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Neurological complications occur in 20%-40% of patients with infective endocarditis. Systemic embolic phenomenon occurs in 22-50% of cases of infective endocarditis and more than 65% of these involve the central nervous system. Embolic strokes have been observed to occur in 19% of patients of infective endocarditis, and 90% of these strokes occur in the middle cerebral artery territory. However, subarachnoid hemorrhage is a rare neurological complication of infective endocarditis, occurring in 1-2% of patients. The etiology of subarachnoid hemorrhage in these patients has been postulated to be due to ruptured intracranial mycotic aneurysms.

We report a 57-year-old patient with Enterococcus fecalis infective endocarditis who presented simultaneously with an embolic stroke as well as anatomically separate subarachnoid hemorrhage. She presented clinically with an acute left hemi-sensory syndrome. Magnetic resonance brain imaging identified 2 concurrent neurological diagnoses: a right posterior cerebral artery territory infarct as well as an unexpected subarachnoid hemorrhage located around the left parietal lobe. Evaluation of the subarachnoid hemorrhage with a computed tomography cerebral angiography and 4-vessel angiogram of the cerebral vessels did not reveal any aneurysm. Subsequent transthoracic echocardiogram confirmed that the patient had a 1.6 cm by 0.6 cm native mitral valve anterior leaflet vegetation. Blood cultures identified Enterococcus faecalis bacteremia confirming the diagnosis of infective endocarditis. The patient denied neither any cardiac symptoms nor any recent dental or surgical procedures in the last 8 years.

Infective endocarditis is a consideration when embolic ischemic stroke and subarachnoid hemorrhage occurs simultaneously. Neurological complications may precede the diagnosis of infective endocarditis.

CONCLUSION: Although not considered a formal therapeutic option for arterial dissection, thrombolysis was administered to this patient before diagnosis was made. It appeared to be beneficial, since the neurological deficits recovered and no bleeding complications were documented.

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Abstract: Hyperhomocysteinemia and factor V Leiden deficiency are two independent coagulopathies, both can lead to venous and arterial infarctions with involvement of multiple small and large arteries and veins anywhere in the body including brain. The case presenting here is unique because of two reasons: first, both Hyperhomocysteinemia and factor V Leiden deficiency are documented with their correspondences; MTHFR (C677T) gene polymorphism and activated protein C resistance respectively; second, by the mode of presentation which had been mistaken with progressive multiple sclerosis in which all signs and symptoms, slowly progressed without any systemic signs, long time after the first presentation.

Key words: Hyperhomocysteinemia-, factor V Leiden deficiency-, MTHFR (C677T) gene polymorphism , activated protein C resistance, Multiple Sclerosis.

75 Interesting and challenging cases

Ischaemic Stroke in a Male to Female Transsexual receiving Cross-sex Hormone Therapy
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Background
Oestrogen therapy in male to female (MTF) transsexual persons has been associated with the adverse effects, including stroke, seen amongst biological women receiving
MTF transsexual persons on cross-sex hormone therapy can lead to increased risk of stroke. Cardiovascular risk factors, and perhaps more specific risk factors for stroke, should be rigorously assessed and modified in these individuals.

Case
A 48 year-old MTF transsexual presented to Accident and Emergency following 2 tonic clonic seizures. On admission she was in a post-ictal state and complained of a headache. Neurological examination was normal aside from minor word-finding difficulties. Blood tests were normal including inflammatory markers, vasculitis screen and antiphospholipid antibodies. A CT head demonstrated a hypodense lesion in the left frontal lobe. Subsequent MRI head demonstrated a wedge-shaped low attenuating lesion with diffusion restriction and some small foci of intralesional haemorrhage. There were no significant stenoses of the internal carotid arteries on MRI angiogram or doppler. Memory impairment and a lack of concentration were the only residual symptoms on discharge. A follow-up MRI confirmed a left frontal lobe infarct. Echocardiogram with bubble study and 7 day heart monitor were normal.

Past medical history consisted of hypertension, hypercholesterolaemia, type 2 diabetes mellitus, transsexualism and current cigarette smoking. Medications included anti-androgen and oestrogen therapy (finasteride 5mg OD, zoladex implant 10.8mg, estradiol valerate 6mg OD). She was treated with clopidogrel, simvastatin and anti-epileptic medication.

Conclusions
The increased cardiovascular risk amongst oestrogen therapy as contraception or post-menopausal hormone replacement therapy. Evaluation of cardiovascular risk factors amongst MTF transsexual persons receiving cross-sex hormone treatment is therefore recommended.

**Interesting and challenging cases**

**Extracranial arteriopathy associated with Sickle-cell disease: review of 4 case reports**


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**Introduction:** Sickle cell disease (SCD) is one of the commonest causes of stroke in children. The vasculopathy usually affects the large intracranial vasculature. Involvement of the extracranial arteries is very rare. Materiels and methods: We report
four cases of SCD patients with an extracranial arteriopathy. Clinical features, biologic exams, MRI, CT-scan angiography, (Transcranial Doppler) TCD and cervical doppler were assessed. Results: We found extracranial vasculopathy in four patients. They were 7 to 33 years old. One recieved hydroxyurea and two had transfusion exchanges. Two were asymptomatic and two had a history of migraine. In all cases, the vasculopathy was discovered after a routine TCD which detected a cervical artery disease indirectly. Two patients remained asymptomatic and one had a stroke after 3 years of follow-up. In two of the four cases the cervical arteriopathy affected more than one vascular axis: the extracranial internal carotid in all cases and also the vertebral arteries in two patients. The lesions consisted of tortuosities, dilatation and stenosis. No associated intracranial arteriopathy was observed on AngioMRI and none had Moya-Moya syndrome or aneurysms. Three patients had small white matter ischemic lesions. Discussion: Few data exist about the detection of extracranial arteriopathy in SCD. The mechanism of the arteriopathy is unknown but the pattern of arteriopathy in our SCD cases is close to the pattern of fibromuscular dysplasia. TCD is very important to detect intracranial artery stenosis but also to suspect an extracranial severe stenosis. Exchange transfusions in patients with high velocities on TCD reduce the risk of stroke dramatically. No data exist to validate this treatment in patients with extracranial cervical stenosis. Conclusion: Extracranial vasculopathy is rare in SCD patients. Other studies are needed to define the patients at risk and to determine the best treatment in order to prevent stroke.

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Haematomyelia as cause of Tako-Tsubo syndrome

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Background

Intramedullary arteriovenous malformations (AVMs) predispose to an elevated risk of rupture causing haematomyelia and compression-induced acute myelopathy. Recently, a type of “stress cardiomyopathy” with transient left ventricular disfuction in absence of coronary disease named Tako-Tsubo Syndrome (TTS) has been described. The biologic mechanism leading to this condition seems to be coronary vasospasm caused by an adrenergic discharge similar to that ob-
observed after subarachnoid haemorrhage. We present a patient with haematomyelia caused by AVMs rupture with TTS.

Case Report
A 39-year-old man was brought to the emergency department for acute onset of chest pain radiated to posterior left scapula and legs weakness. ECG revealed ST segment down-ward, echocardiography showed reduced left ventricular disfunction and cardiac enzymatic release were detected. In the suspicion of acute myocardial infarction heparin therapy was started. A progressive worsening of legs weakness was observed until areflexic paraplegia with decrease pain and touch sensation below the third dorsal level after about 3 hours of symptoms onset. MRI detected an extensive area of haematomyelia from the third cervical to the sixth dorsal level. Spinal angiography showed an AVM at the third dorsal level and bilateral vertebral artery dissection. Heparin treatment was stopped and replaced by steroid therapy. This transient heart failure is consistent with the diagnosis of TTS.

Discussion
TTS caused by acute haematomyelia as “stressing event” has never been reported. Because of its character of reversible left ventricular dysfunction unrelated to a thromboembolic mechanism, a sudden diagnosis of TTS is mandatory to avoid unnecessary and harmful treatments. Besides this observation, another interesting finding of this case is the coexistence of AVM and multiple artery dissection which suggests a genetic predisposition to vascular abnormalities like that observed in connettive tissue disorders.

Spontaneous bilateral intracranial internal carotid artery dissection in the patient with intracerebral haemorrhage
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Background: Spontaneous internal carotid dissection may cause ischemic stroke, with or without subarachnoid hemorrhage particularly in younger patients. We describe a patient with intracerebral haemorrhage and spontaneous bilateral internal carotid dissection.

Case report: A 49-year-old woman presented to the emergency department with sudden onset of right sided weakness and loss of consciousness with a past history of untreated hypertension, without history of neck or head trauma. She complained of preceding headache and she was vomiting. Baseline vital signs were stabile except her blood pressure was 185/120mmHg. She had severe right hemiparesis and motor dysphasia. CT brain scan was done immediately and revealed massive intracerebral haemorrhage in left basal ganglia, thalamus and internal capsula with old bilateral periventricular lacunar infarcts. The patient was admitted in our stroke unit and was treated only with symptomatic therapy. After several days her blood pressure normalized and her neurological status improved, without new neurological symptoms. Magnetic resonance imaging was done after ten days and showed basal ganglia intracerebral haemorrhage.
Background: Trousseau’s syndrome is caused by embolism associated with a disorder of coagulation in patients with malignant tumor. We report herein a rare autopsy case of Trousseau’s syndrome caused by pancreatic mixed ductal endocrine carcinoma with multiple cerebral infarctions in the vertebrobasilar system.

Case: A 78-year-old male with pancreatic cancer fell in his home. He suffered left hemiparesis and was taken to the hospital. Tumor markers were remarkably elevated: CEA 37.6 ng/ml and CA19-9 25500 U/ml. MRI revealed ischemia in the right posterior cerebral artery (PCA) area. Two days after admission, systemic convulsion occurred and the patient became drowsy. He was treated with phenytoin. CT scan revealed an ischemic area in the left PCA on day 6 and in the left cerebellum on day 9. The ischemic area in the left cerebellum underwent hemorrhagic transformation on day 15. The patient died on day 25 from progressed cerebral herniation. Autopsy was performed 15 hours after death.

Results: The cancer comprised two components: adenocarcinoma and a neuroendocrine tumor on the pancreas body. The endocrine tumor expressed a neuron-specific marker such as NSE and synaptophysin. Metastatic foci were found in the liver, ileum and lung. There were many thrombi in the pulmonary vein and multiple occlusions including hemorrhage and acute right parietal infarction, lacunar infarction in the pons with multiple old lacunar infarctions. At the same time the magnetic resonance angiography showed bilateral intracranial carotid dissection before its entry into the petrous portion with formed dissecting aneurysms. Any underlying arteriopathy did not identified. Than she was treated with anti-thrombotic therapy. The patient made good progress and was discharged with mild neurological deficit.

Conclusions: We present this patient with two different associated diseases probably different etiology which requires different management. We suggested that hypertension was probably the major cause of intracerebral haemorrhage but the etiology of carotid dissection stayed unclear so we need to do further investigation.

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An Autopsy Case of Trousseau’s Syndrome Caused by Mixed Ductal Endocrine Carcinoma of the Pancreas

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of the heart, kidney and spleen. However, evidence of vasculitis, such as tumor emboli or non-bacterial endocarditis, was not histologically confirmed.

Conclusions: According to the WHO classification, mixed ductal endocrine carcinoma expresses three histological types: carcinoid-adenocarcinoma, carcinoid-mucinous carcinoid tumor, and mixed exocrine-endocrine tumor. Differentiation into a ductal structure involves expression of tumor markers and mucin production. The pathogenesis of the present case was thought to be a vascular coagulation disorder associated with a mucin-producing adenocarcinoma and a metastatic neuroendocrine tumor.

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Spontaneous spinal epidural hematoma in a patient on cilostazol
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Background: A spontaneous spinal epidural hematoma (SSEH) is an uncommon, yet disabling, cause of spinal cord/cauda equina compression. SSEH is commonly associated with anticoagulation therapy, while antiplatelet treatment-induced SSEH is rare. There are only a few reported cases of aspirin- or clopidogrel-induced SSEH. Here, we present the first case of cilostazol-induced SSEH.

Case:A 67-year-old woman with a history of hypertension and a right pontine infarction 1 year before admission presented to the emergency room with a chief complaint of sudden severe neck pain. An emergency cervical spinal MRI revealed an oval iso-signal intensity mass occupying the right posterior epidural space with a hemosiderin rim from C2-4 on T2-weighted images. The spinal cord was compressed slightly. The patient was diagnosed with SSEH. A follow-up MRI 13 days after the onset revealed complete disappearance of the hematoma and her neck pain had disappeared.

Discussion: Cilostazol is an antiplatelet drug that increases cyclic adenosine monophosphate (AMP) levels in platelets then significant reductions in the secondary combined endpoints of myocardial infarction (MI), transient ischemic attack (TIA), and intracranial hemorrhage. It has a lower risk of bleeding compared to other antiplatelet treatments. Even cilostazol, which is a relatively safer drug in terms of bleeding risk compared to other antiplatelet agents, may cause SSEH. Therefore, physicians should keep rare, but potentially fatal, bleeding complications such as SSEH in mind when prescribing antiplatelet agents.

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Cerebral infarction associated with novel
**H1N1 influenza: a case report**

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Background: A novel H1N1 influenza, a subtype of influenza A, has been characterized; the main cause of death associated with it is severe pulmonary complications. However, it has also been associated with various extra-pulmonary complications, including thrombotic vascular events. To date, there are only a few literature reports about cases of cerebrovascular disease in patients with the novel H1N1 influenza. Even in these reports, the problems were chiefly systemic complications. We report a patient with cerebral infarction, by middle cerebral artery occlusion, who was infected with the novel H1N1 influenza. To our knowledge, this is the first reported case of occlusive arterial cerebral infarction in a patient with the novel H1N1 influenza.

Case: A 58-year-old man with common cold-like symptoms for 2 days presented with left side weakness. Magnetic resonance imaging revealed multiple cerebral infarctions in the right middle cerebral artery territory and it was suggested to be an embolic infarction. However, no cardio-embolic source was detected and laboratory data suggested a coagulopathy. Additional laboratory studies revealed positive results on the novel H1N1 influenza PCR test. On the diagnosis of viral pneumonia and cerebral infarction, antiviral (oseltamivir) and antiplatelet agents were administered. The weakness improved with rehabilitation and he was able to walk again after 1 month.

Discussion: A novel H1N1 influenza can causes vascular thrombotic events, such as ischemic stroke. In our case, a coagulopathy may also have played an important role in the vascular event along with the novel H1N1 influenza. Although the flu pandemic is over, if a patient with flu-like symptoms presents with an ischemic stroke and conventional seasonal influenza detection fails, then the possibility of a novel influenza infection should still be considered.

**Interesting and challenging cases**

**Different pattern of vessel pathology in progressive bilateral vertebral artery dissection – a case report and review of the literature**

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Background and Purpose. We describe a case of a progressive spontaneous bilateral vertebral artery dissection with two types of
trigger is supported by the finding of a seasonal variation in the incidence of spontaneous dissections of the brain supplying arteries, with a peak incidence in the fall.

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Seeing should not always be believing!
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Background
Dide-Botcazo syndrome is a rare syndrome which was first described by Maurice Dide, a French neuropsychiatrist in 1902. It is characterized by cortical blindness, amnesia, and topographical disorientation. This is a case of an 80 year old female patient who presented with cortical blindness and confusion.

Methods
This is an observational case report of a patient who was admitted to the stroke unit at the Charing Cross hospital, London.

Results
This is a case of an 80 year old female patient presented with acute onset of confusion. Clinically she had no focal neurological deficit but marked deterioration of her short term memory, amnesia and cortical blindness with visual anosognosia (she was convinced that she was able to see perfectly well and could see everyone around her). She remained severely disorientated throughout her admission. She was newly diagnosed with probable myeloproliferative vessel pathology.

Case description. A 41 years old male patient suffered from sudden spontaneous neck pain at the left side after paroxysmal coughing starting a few days before. The neurological examination was unremarkable. MRA showed minimal irregularities of the atlas loop of left vertebral artery. ASS treatment was started. Three days later MRA showed an enlarged atlas loop at the left, and heparin treatment was started. In the following days MRA and color-duplex revealed a tight stenosis of the left atlas loop. The patient developed additionally neck pain at the right side. MRA showed beside the tight stenosis at the left atlas loop a mural hematoma at the right vertebral V1-V2-segment with a moderate stenosis. In the following days the tight stenosis at the atlas loop regressed to normal diameter under heparin treatment. Phenprocoumon treatment was started. After 3 month the stenosis at the right side was completely regressed but the left atlas loop showed still mural irregularities. We performed extensive, but unsuccessful, examinations to diagnose the pathogenic agent of the underlying infection.

Discussion. This case is unique because of two pattern of spontaneous artery dissection in one patient. We assume an intima lesion at the left atlas loop with initial enlargement, later on mural thrombosis and finally remodeling of the artery wall. Beside this, a classical spontaneous arterial dissection at the right V1-V2-segment showed the typical MRI pattern of a mural hematoma. A recent history of a respiratory tract infection is a risk factor for spontaneous artery dissection. The possibility of an infectious
effects, including acute ischemic stroke. We report a case of acute thromboembolic stroke secondary to carotid artery dissection during BEP and hypothesise that Cisplatin may have played a role.

Case report:
A 37 year-old right-handed man with no conventional cerebrovascular risk factors presented with right arm clumsiness followed by a transient episode of expressive dysphasia 3 hours later. He was receiving the third cycle of BEP for retroperitoneal GCT. There was no recollection of head/neck trauma, sudden cough or sneeze. He had right-sided mild arm weakness (4/5), difficulty with fine movements of the hand and visuospatial difficulties. Brain CT and MRI-DWI confirmed multiple acute infarctions in the left MCA territory (Figure 1). Serum Magnesium was 0.66 mmol/L (normal: 0.7-1). MRA and CTA (Figure 2) showed a dissection with flaps extending into left internal and external carotid arteries. He was anticoagulated. Four-month follow-up showed almost complete recovery (mRS 1) with normal Doppler flow in the affected artery.

Conclusion:
This is a case of Dide-Botcazo syndrome with the characteristic features of visual anosognosia, amnesia and topographical disorientation. This was caused by acute bilateral occipital lobe, cerebellar hemisphere and thalamic infarcts secondary to thromboembolism from an atherosclerotic right vertebral artery.

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Acute Stroke Secondary to Carotid Artery Dissection in a Patient with Testicular Germ Cell Tumour: Did Cisplatin Play a Role?

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Introduction:
Cisplatin-based chemotherapy -mainly Bleomycin, Etoposide and Cisplatin (BEP) regimen- has significantly improved the prognosis of testicular germ cell tumours (GCT) but it has serious vascular side-effects, including acute ischemic stroke. We report a case of acute thromboembolic stroke secondary to carotid artery dissection during BEP and hypothesise that Cisplatin may have played a role.

Case report:
A 37 year-old right-handed man with no conventional cerebrovascular risk factors presented with right arm clumsiness followed by a transient episode of expressive dysphasia 3 hours later. He was receiving the third cycle of BEP for retroperitoneal GCT. There was no recollection of head/neck trauma, sudden cough or sneeze. He had right-sided mild arm weakness (4/5), difficulty with fine movements of the hand and visuospatial difficulties. Brain CT and MRI-DWI confirmed multiple acute infarctions in the left MCA territory (Figure 1). Serum Magnesium was 0.66 mmol/L (normal: 0.7-1). MRA and CTA (Figure 2) showed a dissection with flaps extending into left internal and external carotid arteries. He was anticoagulated. Four-month follow-up showed almost complete recovery (mRS 1) with normal Doppler flow in the affected artery.

Conclusion:
This is a case of Dide-Botcazo syndrome with the characteristic features of visual anosognosia, amnesia and topographical disorientation. This was caused by acute bilateral occipital lobe, cerebellar hemisphere and thalamic infarcts secondary to thromboembolism from an atherosclerotic right vertebral artery.

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Acute Stroke Secondary to Carotid Artery Dissection in a Patient with Testicular Germ Cell Tumour: Did Cisplatin Play a Role?

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Introduction:
Cisplatin-based chemotherapy -mainly Bleomycin, Etoposide and Cisplatin (BEP) regimen- has significantly improved the prognosis of testicular germ cell tumours (GCT) but it has serious vascular side-effects, including acute ischemic stroke. We report a case of acute thromboembolic stroke secondary to carotid artery dissection during BEP and hypothesise that Cisplatin may have played a role.

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made to minimise the risk of disabling side-effects of BEP. After a stroke, imaging of intracranial and extracranial arteries, monitoring and correction of serum magnesium and discontinuation of Cisplatin-based chemotherapy is recommended.

A 74-year-old man with coronary artery disease suffered from acute nonobstructive cholecystitis and was admitted to nearby hospital. Dual antiplatelets (aspirin and ticlopidine) therapy was discontinued for preparing surgical resection of gall bladder. During his hospital course, he was aware of lumbar pain and weakness in both legs. For further evaluation and therapy, he was transferred to our hospital. The diffuse intra-aortic thrombi were revealed by computed tomography (CT) with contrast media and magnetic resonance imaging (MRI) showed spinal cord infarction. However, CT scans of the descending aorta obtained 4 months before admission exhibited no signs of atherosclerotic plaques as well as intra-aortic thrombi. Laboratory data suggested that antiphospholipid antibody syndrome might have caused these acute multiple intra-arterial thrombi. Restarting dual anti-platelet therapy and dose up of heparin (from 10,000U/day to 15,000U/day), we successfully managed the patient’s clinical condition and symptoms. It is important to understand that stopping the antiplatelet therapy may rapidly grow the thrombus in patient with hyper coagulative state.

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Successful Management of Aortic Thrombi Resulted in Spinal Cord Infarction in a Patient with Antiphospholipid Antibody Syndrome (APS) during Hospital Course of Acute Cholecystitis; Case Report
BACKGROUND Grange syndrome is a recently identified disorder characterized by arterial occlusive disease, hypertension, congenital cardiac defects, bone fragility, brachysyndactyly and learning disabilities. It was first reported in 4 members of a family from U.S., and in two sporadic cases thereafter. We report a new case of Grange syndrome in a patient presenting with subarachnoid hemorrhage (SAH).

CASE REPORT A 18-year old female was admitted because of a SAH due to basilar artery aneurysm rupture. Angiography showed a bilateral ICA occlusion with collaterals from ECAs and posterior circulation. In the acute phase, after the aneurysm coiling, high blood pressure was detected. Abdominal MRA showed a bilateral renal...
arterial stenosis, as well as stenosis of superior mesenteric arteries and celiac tripode. A comprehensive clinical and instrumental evaluation prompted us to rule out alternative possible diagnoses, such as Takayasu syndrome and fibromuscular dysplasia. The presence of other distinctive features, including facial dysmorphisms (ocular hypertelorism, bucktooth, jawboned hypoplasia), cutis marmorata, syndactyly and learning disabilities, could suggest a connective tissue disorder; however, family history was unremarkable and sequencing of TGFBR1-2, COL3A1 and ACTA2 genes was negative. Chromosomal diseases were also excluded. COMMENTS Grange syndrome was first reported in a family in which 4 sons were affected, thus suggesting a recessive disease. Since most of the syndrome signs are autosomal dominant, alternative explanations include an autosomal dominant inheritance with incomplete penetrance or parental gonadal mosaicism. Other two cases with a negative family history were described thereafter, suggesting the possibility of sporadic cases, as well. Based on our findings and because of the specific vascular and systemic features, we hypothesized the patient was affected by Grange syndrome.

Interesting and challenging cases

Cocaine addiction relieved by a striatal lesion: cues to a future treatment approach?
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Background: The mesolimbic, mesocortical and mesostriatal dopaminergic pathways regulate the brain’s reward circuitry. Synaptic dopamine concentration rises with gratifying experiences. By inhibiting the presynaptic reuptake of dopamine, cocaine procures satisfying sensations while its withdrawal favors seeking behaviors. Animal and functional studies support the central role of the mesostriatal pathway and the dorsolateral striatum (DLS) in cocaine addiction. In rats, DLS lesions attenuate cocaine seeking behaviors. Methods: Case report. Results: 45-year-old, right-handed man consulted for acute hemiparesis. His past medical history was unremarkable, except for antisocial personality traits. He was repeatedly incarcerated and had regular contacts with prostitutes. He started smoking cigarettes and using illicit drugs at age 9, with up to 7 g/d of intravenous or inhaled cocaine from age 24. He reported headaches with continuous intense daily urges to seek cocaine since the initiation of a behavioral drug abstinence therapy a month before presentation. Physical exam revealed skin tattoos, poor mouth hygiene with dental abscesses, no clinical evidence of endocarditis, and proportional hemiparesis. Brain MRI showed acute infarct of the left DLS. Investigation found a left internal carotid artery dissection and mitral vegetations with negative blood cultures. Hemiparesis regressed completely within a few days. Remarkably, he reported no further
Cerebral venous thrombosis (CVT) as an extrahepatic manifestation of acute anicteric hepatitis A (HAV) infection

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Background

CVT accounts for <1% of all strokes. Risk factors can be divided into acquired or genetic. A different way to classify the predisposing conditions to CVT is to non-infectious and infectious (local or systemic). An association of CVT with HBV and HCV infection was previously described in two cases.

Case

A 31-year-old woman with no past medical record presented with a 48h history of headache and vomiting. Three days prior to her admission she returned from a short trip to her home country. She was not smoking, using drugs or alcohol. She has one child delivered normally and she never had any abortions.

General physical examination was unremarkable but neurological revealed right hemiparesis and total aphasia. Routine blood tests showed elevated CRP. CT, CTA and MRV indicated left transverse, superior sagittal and left sigmoid sinuses thrombosis associated to left parietal and temporal hemorrhagic venous infarcts.

Further investigation for collagen related diseases, including serum cryoglobulins, were negative. Antithrombin III, factor V Leiden, PCGlob-FVNR and protein C and S levels were normal, when the molecular genetic screening for thrombophilia revealed heterozygosity for G20210A and 677T mutation.

On day 10, she complained for right upper quadrant pain and vomiting. The liver enzymes gradually increased and it was difficult to maintain the target INR even with tiny warfarin doses. Further investigation revealed serum IgM antibodies to HAV in high titles when all other hepatotropic virus infections were excluded.

Anticoagulation was maintained with war-
farin. In 6 months follow-up general exam was unremarkable when in neurological exam right arm weakness was present.

Conclusion
We report for the first time a case of a patient with CVT manifested 10 days prior to the clinical expression of acute anicteric HAV infection. The hypothesis of HAV as a triggering factor of immune mediated CVT deserves further attention by the clinicians.

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**Recurrent Ischaemic Events due to Cardiac Papillary Fibroelastoma: The value of transesophageal echocardiography.**

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**Background:**
Primary cardiac tumours are extremely rare but are a well-recognized cause of stroke. Papillary fibroelastomas are the second most common cardiac tumour in adults. We present the case of a patient presenting with recurrent cerebrovascular events who was ultimately diagnosed as having a Papillary Fibroelastoma, evident only on transesophageal echo (TOE).

**Case:**
A 57 year old lady presented with transient right-sided upper limb weakness and speech disturbance that resolved after 30 minutes. Vascular risk factors comprised hypercholesterolaemia and hypertension. MR imaging confirmed a subacute left frontal infarct, MR angiography of neck and intracranial vessels was clear. Cardiac investigations including transthoracic echocardiography (TTE) and 24-hour holter monitor were normal. She was commenced on aspirin. In 6 months follow-up general exam was unremarkable when in neurological exam right arm weakness was present.

**Conclusion**
We report for the first time a case of a patient with CVT manifested 10 days prior to the clinical expression of acute anicteric HAV infection. The hypothesis of HAV as a triggering factor of immune mediated CVT deserves further attention by the clinicians.
on aspirin and discharged. Five months later she presented with transient left arm and left leg weakness that fully resolved. Repeat MR imaging did not show any further ischaemic event, repeat TTE and holter were normal. Dipyridamole was added to her medications. One year later she complained of acute unsteadiness, further MR imaging showed an acute right-sided cerebellar infarct. TOE revealed a 1.48 x 2cm mobile mass in the left atrium located postero-laterally adjacent to the left pulmonary veins; this was confirmed on cardiac MRI. Review of her prior TTEs showed the mass to be invisible to the transthoracic approach but readily identifiable on TOE. She proceeded to emergent cardiac surgery and post excision the histology confirmed a Papillary Fibroelastoma as the cause of her recurrent ischaemic events.

Conclusion:
Our case illustrates the importance of thorough investigation in the patient presenting with recurrent stroke. Despite extensive work up on each presentation the cause of her recurrent ischaemic events were not elucidated until TOE was performed. Clinicians should be aware of the limitations of TTE and proceed to TOE if no cause is identified.

RUPTURE OF FUSIFORM ANEURYSM IN A PERSISTENT TRIGEMINAL ARTERY: A RARE CAUSE OF SUBARACHNOID HAEMORRHAGE
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Background and Methods.
Persistent trigeminal artery (PTA) is an infrequent anastomoses of embryonic origin connecting the cavernous portion of internal carotid artery with the basilar artery. It is usually an incidental finding, although it has occasionally been associated to trigeminal neuralgia and intracranial aneurysms. Rarely, subarachnoid haemorrhage has been reported and endovascular treatment attempted.

Results.
A 77-year old woman, with history of hypertension and biological aortic prosthesis, presented a thunderclap headache with nausea and vomiting. CT revealed infratentorial subarachnoid haemorrhage. Urgent angiography showed a left PTA with fusiform dissection, with no others aneurysms.
or malformations. A second angiography 15 days later revealed no new aneurysms. A favourable clinical and angiographic balloon occlusion test was achieved, so endovascular occlusion of PTA was performed in three sessions, obtaining a positive clinical and angiographic result.

Conclusions.
Dissecting aneurysms in PTA should be considered a possible cause of subarachnoid haemorrhage. Embolization of PTA may be challenging but feasible. Occlusion test prior to treatment is recommended.

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Occipital infarct with a large patent PCA
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A 81-year-old man noticed blurring of vision, mild left side weakness and bumping into objects over left side 1 day before admission. He had known hypertension and history of ischaemic stroke with left weakness in year 1992 and 1994. He was on aspirin and made a good recovery. He remained well without further neurological event until this admission. Physical examination revealed newly detected AF, left homogenous hemianopia, full muscle strength, normal reflexes and plantar response. The NIHSS score was 2. AF. Plain CT brain showed an infarction over right occipital lobe. MRI on day 7 showed subacute infarction similar to CT finding. MRA showed right MCA occlusion, hypoplastic right ACA. The right PCA was patent and prominent. The distal right cortical vessels were present. Transcranial doppler ultrasound detected a higher flow velocity at right PCA (107 cm/s) than left PCA (62 cm/s).

The interesting point of this case was the apparently incongruity between the infarct location and the MRA finding. The site of infarction seem to be a right PCA occlusion sequelae, but the right PCA was patent and “paradoxically” large, with a “silent” right MCA occlusion. On careful study on the CT, the extent of infarction was slightly larger than a PCA territory. Usually, PCAs only supply a small portion of parietal lobes and end at the posterior MCA-PCA border-zone. With significant MCA disease, collateral flow from PCA could developed through soft dural anastomosis and supply MCA territory.

We concluded that the patient suffered from a “new” cardioembolic PCA infarction, on a background of chronic right MCA occlusion with good collateral flow from PCA and possibly right ECA branch. The patient remain neurologically “silent” despite severe MCA disease is likely because the MCA territory was well perfused from collateral vessels. The patient was put on anticoagulation for stroke prevention.

It is important for clinician to aware of the discrepancy from typical stroke pattern and raised suspicion on unusual stroke mechanism and prompt for further neuro-vascular investigations.
internal carotid artery (ICA) are commonly combined with ischemic stroke or less frequently with isolated cranial nerve palsy. We report a case of consecutive bilateral ICA dissection manifesting with consecutive bilateral hypoglossal palsies without cerebral ischemia. CASE REPORT: A 74-year old previously healthy man presented with paraesthesia of his right lower jaw, masticatory problems and right-sided headache after 3-4 weeks with strong tracheal cough. In the clinical examination, he had a right sided Horner’s syndrome and a hypoglossal palsy of the right side. MRI including MR-angiography showed no cerebral ischemia (particularly not in the brain stem) but a small aneurysmatic drift of both ICA extending from the cervical to the petrosal part with environed T1-hyperintense signal. Carotid Duplex sonography showed a hypoechoic thickening of the right ICA approximately 3cm from the right bifurcation with normal flow velocity and no signs of atherosclerosis, suggestive of a dissection of the right ICA. Under initial treatment with acetylsalicylic acid, the patient developed dysarthrophonia, dysphagia and bilateral hypoglossal palsies. Follow-up MRI showed a T1-hyperintense intramural hematoma surrounding both ICAs in a semilunar shape. Cerebral ischemia could be excluded. Under anticoagulative therapy with the vitamin K antagonist phenprocoumon, the patient completely recovered after six months, and MR and sonographic imaging showed normalized findings. CONCLUSION: Bilateral simultaneous hypoglossal palsies as a result of bilateral acute ICA dissection without stroke are
very rare. In the present case, shear forces due to heavy coughing may have been the triggering factor for the dissections. As cerebral ischemia could be excluded, bilateral hypoglossal palsy was probably caused by direct compression of the nerve by the aneurysmatic drift or by hypoperfusion of the nerve vasculature. 

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Cardiocutaneous Syndrome and Stroke: a student collapses in a nightclub with a right hemiparesis.
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Dermatological conditions can be associated with stroke and are often recognisable. One such condition is cutaneous pigmented lesions, or lentigines, associated with arterial dissection and cardiac abnormalities; such as conduction defects and atrial myxomas. These are syndromes such as: CAR-NEY, LAMB, LEOPARD and NAME. The pigmented lesions present in childhood and the cardiac abnormalities develop in teenage years.

Case Report

A 21 year old male student collapsed at a nightclub, assumed to be due to the ingestion of recreational drugs. He developed right sided focal motor seizures and a dense right hemiparesis with a speech disorder. Computerised tomography (CT) of his brain revealed an extensive left middle cerebral artery infarction. Further clinical evaluation revealed an abnormal phenotype with multiple pigmented lesions, lentigines, on the skin and lips, a high arched palate and dactylomegaly. (picture attached.) His electrocardiogram (ECG) showed sinus rhythm and left ventricular hypertrophy, an urgent echocardiogram (TTE) revealed a large left atrial myxoma. A diagnosis of “cardiocutaneous syndrome” was made. His myxoma was excised and he underwent a period of physical rehabilitation. Follow up TTE has shown no myxoma recurrence. Cardioembolic stroke accounts for 20% of all ischaemic strokes, the majority of these are from atrial fibrillation. Atrial myxomas are a rare condition and usually occur spontaneously, although approximately 10% are familial.

Conclusion

This case demonstrates the importance of early recognition of lentigines as part of a cardiocutaneous syndrome; particularly in childhood/adolescence alerting to a potential cardiac abnormality and thus reducing the risk of subsequent stroke though atrial myxoma.
A 57-year-old woman was admitted to our stroke unit with a right hemispheric, territorial middle cerebral artery (MCA) stroke. Due to a religious delusion she had spent several days kneeling on the floor of her house and abstaining from nutrition and fluid intake before she experienced the stroke. In the initial neurological examination she was stuporous, and showed a left-sided hemiparesis, neglect and dysarthric speech. CT-scan of the brain revealed a sub-acute infarction in the right MCA territory along with an insular dot sign indicating M1/M2-thrombosis (Figure 1a). On carotid ultrasound, we found a large floating embolus nearly occluding the right common carotid artery and extending into the internal carotid artery (Figure 1b), which from the morphological appearance represented a beak-shaped spout venous thrombus with several branching points. Ultrasound of the leg veins indeed showed bilateral deep vein thrombosis, and CT-scan of the chest documented massive central pulmonary artery embolism on both sides. Finally, transesophageal echocardiography unraveled a large patent foramen ovale (PFO) with a significant right-to-left shunt and signs of prominent right ventricular overload. The patient had no previous history of venous or arterial thrombosis, and a thorough laboratory work-up for coagulation abnormalities remained unremarkable. Her vascular risk factors included smoking and heavy alcohol consumption. On the day of admission to our stroke unit, the vascular surgeon skillfully performed a catheter-thrombectomy of the right carotid arteries under heparin protection (Figure 1c).

Conclusion: Plenty of indirect evidence suggests paradoxical embolism to be a key pathomechanism in patients with cryptogenic stroke and PFO but direct proof of this view is sparse. There are few cases in the literature with a thrombus riding in or just crossing through the PFO. Our patient is another case with definite paradoxical embolism, and the first one demonstrating that even very large emboli can pass a PFO once pulmonary artery embolism had raised pressure in the pulmonary circulation.
Background: Isolated weakness of the hand due to stroke is rare, and can be a clinically challenging syndrome.

Methods: Stroke admissions to our department with close to a thousand annual stroke cases have been carefully followed. All patients to this study were recruited prospectively during clinical rounds. Clinical signs, results of neuroimaging (brain CT or MRI) were recorded, and etiologies were evaluated by the TOAST criteria. All patients had ECG, carotid duplex sonography and transthoracic echocardiography.

Results: Between 2006 and 2011 we identified 12 patients (6 women, mean age: 67 ± 11 years) for this study. In 11/12 patients this was a first-ever stroke. All patients presented isolated weakness of the distal upper limb. Associated signs were increased brachial and brachioradial reflexes (7/12 patients), and mostly transient upper limb numbness (8/12 patients). Small infarction in the corresponding hand knob area of the precentral gyrus was found by CT scans in 5 cases and by MRI scans in 7 patients. One patient had bilateral isolated hand palsy and the MRI confirmed symmetrical infarctions in the precentral gyri. Symptomatic high grade internal carotid artery stenosis was found in four patients, four had cerebral small vessel disease, and cardioembolic mechanism was responsible for the signs in 2 cases. Two cases had unknown etiology. Hypertension was the most prevalent vascular risk factor (10/12), followed by smoking (8/12) and hyperlipidemia (7/12).

Discussion: Small infarct in the hand knob area presenting as a distal upper limb weakness is a rare syndrome – appearing in less than 0.5% of all ischemic strokes. Associating reflex- or sensory signs may help to differentiate from peripheral neuropathy. Precise evaluation of the clinical and radiological profiles proves that a cortical lesion is responsible for the syndrome.

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ONE young patient, TWO strokes in THREE days, FOUR interventionists performing FIVE catheter interventions in SIX days, ZERO final NIHSS outcome – interdisciplinary stroke care beyond the guidelines

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Background: Stroke physicians regularly face complex clinical situations that are not covered by stroke management guidelines. We report a stroke patient who posed serious decision-making problems right from
21. European Stroke Conference

the very start. Successful treatment mainly relied on interventions currently considered as “experimental” or “controversial”.

Case description: A 48-year-old woman was admitted with isolated expressive aphasia of sudden onset and fluctuating severity. The initial NIHSS score was 1. Multimodal MRI/MRA showed subtotal occlusion of the left M2 segment of the superior branch of the medial cerebral artery and marked perfusion-diffusion mismatch in the respective territory. Fearing an infarction in the speech-dominant hemisphere, we decided against intravenous thrombolytic treatment due to a time window >4.5 hours and opted for conventional angiography. Intraarterial alteplase had no effect, but subsequent mechanical thrombectomy led to complete vessel recanalisation. Her postinterventional NIHSS was 0. Systematic work-up revealed a large persistent foramen ovale (PFO). Ultrasound suggested deep vein thrombosis in her left leg, which was later confirmed by phlebography. Three days after the incident event, despite intravenous heparin, she developed acute expressive aphasia and mild right-sided brachiofacial hemiparesis. Repeat MRI/MRA showed re-occlusion of the left M2 segment. Mechanical thrombectomy again was successful with complete recanalisation and a postinterventional NIHSS of 0. She was found to have thrombophilia due to a Factor V-Leiden mutation. A vena cava filter was placed temporarily. She underwent interventional PFO closure, remained symptom-free, and eventually was put on oral anticoagulation.

Conclusion: Our case report illustrates the advantages of a modern interdisciplinary stroke centre that offers angiography and interventions on a 24/7 basis enabling much-needed individualized decisions when there is no guidance by current stroke guidelines.

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A first case of mortality due to intraparenchymal cerebral haemorrhage post stroke thrombolysis in a teaching hospital: thrombolysis versus cerebral amyloid angiopathy

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Background
Stroke thrombolysis is offered to a selected group of patients with an acute neurological symptoms or signs without contraindications. We report a case of a 75-year-old woman who developed intra-parenchymal haemorrhage post thrombolysis and had cerebral amyloid angiopathy on autopsy.

Method
A 75-year-old woman with a background history of hypertension, type II diabetes mellitus and hypercholesterolemia presented to emergency department within 51 minutes of acute onset left arm weakness, left facial droop and speech disturbance. She was on aspirin 75mg, bisoprolol 2.5mg, perindopril 5mg and furosemide 20mg daily, and insulin. Her blood pressure was 170/80mmHg and national institute of health stroke score 7/42. Computed tomography (CT) brain scan revealed evolving right middle cerebral artery infarct, serum glucose 12.8 mmol/l and all other blood tests were normal. Thrombolysis therapy was discussed and she consented to treatment which was started 2 hours after onset of symptoms.

Results
Ten hours after thrombolysis glasgow coma scale (GCS) dropped to 8/15 with profound left hemiparesis. Urgent CT brain scan revealed intra-parenchymal haemorrhage with intra-ventricular extension and midline shift. Neurosurgical intervention was not warranted due to marked bleed and low GCS. She died peacefully 62 hours after the onset of stroke symptoms. The final neuropathological diagnoses from autopsy were those of recent large infarct on right middle cerebral artery distribution with haemorrhagic transformation, massive, leading to bilateral uncal herniation and severe amyloid angiopathy involving meningeal and intra-parenchymal vessels.

Conclusion
The case illustrates an important concept that needs to be explored further regarding cerebral amyloid angiopathy and the risk of bleeding with thrombolysis. It raises an important question of who to screen and how to screen them before thrombolysis.
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Central artery of Percheron syndrome presenting as transient bilateral motor weakness, vertical gaze palsy and alternating level of consciousness
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Background
The thalamus is supplied by the posterior cerebral and communicating arteries. The perforators to the thalamus may originate from one segment of posterior cerebral artery to supply both thalami and share the origin with those to the midbrain. We report a case of a 65-year-old woman with acute transient bilateral motor weakness, vertical gaze palsy and alternating level of consciousness.

Methods
A 65-year-old woman with background history of probable left eye retinal detachment presented to emergency department within 2 hours 50 minutes of an acute onset transient right sided weakness followed by marked left sided weakness. Her national institute of health stroke score was 23/42. Computed tomography (CT) brain scan revealed sub-acute right occipital and left middle cerebral artery infarcts, and due to the findings thrombolysis was contraindicated. Neurological examination 15 hours after admission revealed normal power in all limbs, vertical gaze palsy and alternating glasgow coma scale from 8-15/15.

Results
Magnetic resonance imaging (MRI) brain scan revealed acute bilateral thalami infarcts, right extending into the right mid-brain and CT angiogram revealed less than 50% narrowing at the origin of the internal carotid arteries bilaterally, vertebral arteries within normal limits, left vertebral artery arising from the aortic arch and incomplete circle of Willis with no posterior communicating arteries. Trans-oesophageal echocardiography revealed mild aortic atheroma with positive bubble study consistent with patent foramen ovale. She was treated with lansoprazole 30mg, atorvastatin 40mg daily, and aspirin 300mg daily for 2-weeks followed by aspirin 75mg daily and aspirin/dipyridamole 25/200mg twice daily and underwent extensive neurorehabilitation.

Conclusion
We postulate that this case of bilateral acute thalami infarcts represents single arterial supply by the central artery of Percheron and mechanism of stroke is cardio-aortic embolism.
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Cholesterol emboli syndrome (CES) following stroke thrombolysis and anticoagulation with warfarin
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65 year old Caucasian man presented to A&E within 45 minutes of developing sudden onset right sided weakness of upper and lower limbs associated with right-sided facial weakness, dysphasia and reduced consciousness. He had a known history of CKD stage 3; HTN; IHD; an infra-renal AAA and newly diagnosed paroxysmal AF. NIHSS of 13 on admission with a GCS of 10/15. Post-thrombolysis CT scan showed an infarct within the territory of left MCA. He recovered with minimal residual neurological signs, modified Rankin score of 1, and was discharged with a plan to start warfarin therapy in the community due to his high risk of further thromboembolic events (CHA2DS2VASc = 5).

3 weeks after starting warfarin he developed symptoms of malaise, GI upset, loss of appetite, painful discoloration of his feet and livedo reticularis spreading to thighs bilaterally. He independently stopped warfarin therapy and his GP referred him to stroke physicians with ‘purple-toe syndrome’ and recommenced aspirin therapy. At clinic his creatinine was found to be 403 (eGFR 13). Urgent transfer was made to the renal unit. Blood test showed eosinophilia. After imaging studies and an acute renal screen the diagnosis was made of cholesterol emboli syndrome secondary to warfarin therapy.

During his inpatient admission he had an episode of collapse followed by expressive dysphasia (NIHSS 2). He was commenced on clexane 1mg/kg due to his high risk of further thromboembolic disease and potential for further cholesterol emboli with aggressive anticoagulation.

Conclusion: Diagnosis of CE can be difficult due to a variable clinical presentation such as livedo reticularis, cyanotic toes, gastrointestinal bleeding or perforation, acute renal failure, retinal emboli and CNS involvement. A thorough clinical history and physical examination are essential steps in establishing a diagnosis. Confirmatory diagnosis requires biopsy of target organ.

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Phenotypical variability of post partum reversible cerebral vasoconstriction syndrome a serie of four consecutive cases
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Background: Reversible cerebral vasoconstriction syndrome (RCVS) is a condition of the puerperium. Its clinical course has been described to be more malignant occasionally than this name suggests. We present one severe case in detail and discuss and summarize three other cases. Case report: 5 days after an uncomplicated child birth, a 40 year old otherwise healthy woman developed sudden and severe persisting headache and suffered two days later a generalized epileptic seizure. She complained of headache, responded slowly to questions, had elevated blood pressure (200/100 mmHg), right peripheral visual deficits and extensor pyramidal signs on the right. Afterwards she developed severe right-sided hemiparesis and became aphasic. Consistent to the clinics not the initial but further serial MR scans showed vasogenic oedema, ischemic infarcts a severe general vasoconstriction. Serum markers for connective tissue diseases, systemic vasculitis, urine catecholamines and investigation of cerebrospinal fluid, biochemical testing for porphyrias, as well as transthoracic echocardiography were unremarkable, but she took some cabergoline to stop lactation. For therapy i.v nimodipin and triple H therapy were started with no improvent of clinical status and vasoconstriction on TCD exams and MRI scans. So we added i.v. methylprednisolon at a dosage of 1000 mg daily over five days was added, with dose tapering to 80 mg orally until discharge. Under this treatment, the patient substantially improved and MR showed rapid regression of vasoconstriction and vasogenic edema, and shrinking of DWI (diffusion weighted imaging) lesions. Conclusion: Thunderclap headache, seizures and occasionally visual or sensorimotor deficits in combination with normal CSF and segmental arterial vasoconstriction are typical for RCVS. In postpartum cases ergoline medication might facilitate vasoconstriction. Usual treatment consists of i.v nimodipin but in our and other literature cases with aggressive vasculitis like courses of the disease steroid therapy is effective. On basis of this and three other cases possible treatments and differential diagnosis are discussed.

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Carotid Artery Stent Thrombosis in relation to Clopidogrel resistance.
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Background: A case report of in-situ carotid artery stent thrombosis that may be related to Clopidogrel resistance.
Methods: A 76-year old male, with a history of hypertension, atrial fibrillation, subdural haematoma with Burr hole evacuation and Percutaneous Left Atrial Appendage Transcatheter Occlusion implantation, presented to the Emergency Department with a left-sided hemimotor deficit, facial droop and dysarthria. NIHSS=9, BP=151/92mmHg, HR=68bpm. Neurological examination showed upper limb power (1/5) > lower limb (3/5). CT brain (CTB) showed no acute infarct/haemorrhage. CT angiogram (CTA) showed >90% right internal carotid artery (RICA) stenosis. As his neurological symptoms initially recovered and disimproved later, a cerebral angiography and stenosis stenting were performed. Post-procedure, Aspirin and Clopidogrel were started, with Omeprazole for gastroprotection.

Results: MRI brain (2-days post event) showed watershed infarcts between the middle cerebral and right anterior/posterior cerebral artery territories. Carotid duplex showed RICA patency with poor apposition. No thrombus on PLAATO device or patent foramen ovale was detected on transsoesophageal echocardiogram. He developed new onset left lower limb paresis on Day 9 post-admission. Urgent CTB showed no acute infarct/haemorrhage. CTA revealed stent patency with in-situ thrombosis (confirmed by cerebral angiography). The VerifyNow Aspirin Test® showed platelet inhibition at 401ARU (normal range 350-700ARU), whilst VerifyNow P2Y12 Test® revealed no platelet inhibition activity with Clopidogrel. Consequently, Prasugrel was started and a subsequent P2Y12 test showed 65% platelet inhibition activity. He was commenced on Heparin and this was later changed to Warfarin.

Conclusion: Failure to respond to Clopidogrel may have been due to concomitant use of Omeprazole or from a genetic polymorphism for cytochrome P450 2C19. Prasugrel can be considered as an alternative for those who do not respond to Clopidogrel.

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A case of a traumatic trigeminal-cavernous fistula occluded by coil embolization

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BACKGROUND: A trigeminal artery as the most common persisting embryonic carotid-basilar anastomosis is found in up to 0.2% of adults. In rare instances, trigeminal-cavernous fistulas develop either spontaneously or after a trauma.

RESULTS: We present a 16-year-old patient with a traumatic trigeminal-cavernous fistula (Saltzmann type 2), which was successfully treated by interventional occlusion of the persistent trigeminal artery. After intervention, clinical symptoms (chemosis, right-temporal bruits, and sixth nerve palsy) resolved.

DISCUSSION: In this case, fistula occlusion was achieved by coil embolization with only 4 coils placed directly at the rupture point of the trigeminal artery but not into the cavernous sinus. Thus, the cavernous sinus was preserved in function and structure. Special anatomy and interven-
“Can somebody please turn on the lights?” Posterior reversible encephalopathy syndrome following general anaesthesia: a case report and review of the literature.

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Introduction:
Posterior reversible encephalopathy syndrome (PRES) describes an uncommon collection of neurological symptoms with associated characteristic radiological appearances of oedema in the posterior cerebral white matter. Common trigger factors for PRES are acute onset and severe hypertension. Other trigger factors include the use of immunosuppressive drugs, eclampsia, septic shock, SLE and nephrotic states. PRES has been rarely reported in acute stage immediately after general anaesthesia. We report a case of PRES in a woman in the immediate post-operative period following a hip replacement without known risk factors.

Case Description:
A 66 year old woman was admitted to hyper-acute stroke unit following hip arthroplasty done under general anaesthesia, and symptom of sudden onset of complete visual loss after the surgery in recovery room. Patient on clinical examination was unable to perceive light stimuli with no visual acuity. Patient was very confused and agitated but had no other focal deficit. Patient’s cortical blindness post-operatively, initially was thought as embolic stroke affecting occipital region. The subsequent MRI-DWI imaging showed restricted diffusion in bilateral occipital with swelling extending into the lateral temporal and parietal lobes. These appearances were suggestive of PRES, rather than acute infarction as the primary cause of her symptoms. She also had CT angiogram which was normal and later after few weeks had repeat MRI which showed persisting white matter signal abnormality with reduction in cortical swelling. Patient’s vision improved slowly in few months and she made good recovery after rehabilitation.

Conclusion:
We highlight this case to demonstrate the importance of recognising the association of PRES with administration of general anaesthesia. It is unclear whether it is cause of PRES or trigger in already primed patient. But it is important to be aware and recognise this syndrome in immediate post-operative period.
etiology, is involved in more than half of the cases. We report a case of hemiballism, due to an extraluysian lesion, in a patient who was treated off-label with intravenous alteplase.

CASE REPORT: A 74-year-old man, with an history of hypertension and dyslipidemia, presented a left motor disorder on his arrival to the emergency room. On examination he had left-sided hemiballism involving the face and both limbs and a cerebral CT-scan showed only chronic signs of vascular leucoencephalopathy. Despite having a normal NIHSS, in accordance to the clinical signs and after exclusion of other possible causes related to the development of this hemiballism (e.g marked hypoglicemia), he was thrombolysed with alteplase (67.6 mg iv) at 4 ½ hours from the stroke onset. After this treatment, choreiform movements were less pronounced. The following day, a brain MRI showed an ischemic lesion of the right capsula extrema and insular cortex and the integrity of both subthalamic nuclei. Another smaller lesion was found in the right temporal-parietal cortex. The patient recovered completely in three days without receiving any further symptomatic therapy.

CONCLUSION: Hemiballism has been classically characterized as pathognomonic of a lesion in the contralateral subthalamic nucleus. However, several cases due to a lenticular or caudate lesion or even cortical, as in the present case, have been described. Prognosis is benign in most cases, but it seems logical to treat these cases with thrombolysis when they are seen within an appropriate time frame in the emergency room.

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Off-label thrombolysis in a case of ischemic hemiballism: a case report
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INTRODUCTION: Hemiballism is a rare movement disorder, accounting for a negligible percentage of all hyperkinetic disorders. A lesion of the contralateral subthalamic nucleus, commonly due to a vascular
unfractionated heparin, the patient did not improve significantly, and was transferred to a neuro-rehabilitation centre for intensive physiotherapy, and speech and language therapy.

DISCUSSION
Lateral medullary stroke or Wallenberg’s syndrome is a consequence of disruption of arterial flow in the posterior cerebellar artery or vertebral artery. Treatment is mainly symptomatic and prognosis is dependent on the size and location of the affected area. However, misdiagnosis can put patient at risk of life-threatening complication, such as aspiration pneumonia, which our patient developed. Therefore, good clinical examination skills and high index of suspicion are essential for its timely diagnosis and patient management.

Interesting and challenging cases

Lateral Medullary Syndrome – Misdiagnosed
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INTRODUCTION
A combination of ataxia and vomiting in young adults is commonly attributed to acute labyrinthitis. As such, patients rarely undergo extensive investigation. This is a complicated case of ataxia and vomiting with a less than benign cause.

CASE PRESENTATION
A 35-year-old woman presented to the Accident and Emergency department with 2-hour history of vomiting, slurred speech, and unsteadiness. On examination, she had slurred speech, dysphagia, diplopia, reduced sensation and power on left side of face, and ataxia. The senior A&E clinician made the diagnosis of acute labyrinthitis and patient was discharged home with prochlorperazine to abate symptoms of ataxia and vertigo.

She was re-admitted 3 days later under the medical team with aspiration pneumonia. Her speech disturbance and swallow impairment were more profound. As her CT brain scan revealed no abnormalities, she underwent an MRI brain, which showed a left lateral medullary infarct. The subsequent MR angiogram showed left vertebral artery dissection. On further questioning, the patient recalled suffering whiplash injury in a car accident 3 weeks prior to the onset of symptoms.

Despite commencement of intravenous unfractionated heparin, the patient did not improve significantly, and was transferred to a neuro-rehabilitation centre for intensive physiotherapy, and speech and language therapy.

DISCUSSION
Lateral medullary stroke or Wallenberg’s syndrome is a consequence of disruption of arterial flow in the posterior cerebellar artery or vertebral artery. Treatment is mainly symptomatic and prognosis is dependent on the size and location of the affected area. However, misdiagnosis can put patient at risk of life-threatening complication, such as aspiration pneumonia, which our patient developed. Therefore, good clinical examination skills and high index of suspicion are essential for its timely diagnosis and patient management.

Interesting and challenging cases

Neurological manifestation as initial presentation in a case of Pulmonary Arteriovenous Malformation (PAVM)
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Background
Pulmonary arteriovenous malformations (PAVMs) are vascular malformations between pulmonary arteries and pulmonary veins with right to left shunt, which can be congenital or acquired, single or multiple. Neurological complications of PAVMs include stroke, TIA, cerebral abscess and seizures.
Presentation
We report a case of a 72 year old female with a history of hypertension and previous CVA, and a long history of breathlessness on exertion, who presented with a further episode of right sided facial numbness and slurred speech. She was treated as a left anterior circulation TIA. Diagnostic work up for source of embolic stroke including ECG, transthoracic echo, CT brain and carotid doppler was negative, however chest x-ray, contrast CT chest, and bubble contrast echo study revealed an isolated PAVM with right to left shunt. This was confirmed by pulmonary angiogram which showed the feeding artery size of 5mm in diameter and treatment was attempted by embolotherapy. Unfortunately the PAVM ruptured and she required surgical removal of PAVM.

Discussion
PAVM’s are common in patients with Hereditary Haemorrhagic Telangectasia, however the incidence of isolated PAVM with paradoxical embolism is rare. The incidence of stroke in PAVM is suggested to be between 4-37% in multiple PAVMs but the incidence in isolated PAVMs is unclear but very low. The oldest person with stroke and PAVM recorded in literature is 77yrs. Pulmonary angiography remains the gold standard for diagnosis, precise location and definition of the AVM. Stroke most likely occurs in PAVM patients with feeding arteries more than 3 mm in diameter. Following diagnosis, the treatment of choice is transcatheter embolotherapy with coil or balloon or both.

Despite the likelihood of having more risk factors in an elderly patient, we should always consider PAVM as a differential cause for embolic stroke. Closure or removal of the PAVM is an efficient way of preventing further episodes of paradoxical embolism.

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COILING OCCLUSION OF VERTEBRAL ARTERY FOR A PATIENT WITH RECURRENT POSTERIOR CIRCULATION TIAS
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INTRODUCTION
Acute basilar artery occlusion is a life threatening condition with mortality of
Coiling occlusion is a standard treatment for the management of intracranial aneurysms. To our knowledge this is the first report of successful treatment of recurrent posterior circulation embolism from an occluded vertebral artery by coiling occlusion of the distal non-occluded segment of the affected vertebral artery.

**CASE REPORT**

A 60 year old woman presented with 2 days history of sudden onset headaches, vomiting and vertigo. Physical examination revealed left hemi ataxia and left facial sensory loss. The computed tomography (CT) scan showed an acute left posterior inferior cerebellar artery (PICA) territory infarct. The CT angiogram showed a stenosis and a thrombus at the origin of the left vertebral artery with further thrombus and occlusion distally. After initial improvement with IV heparin she developed a mild left hemiparesis, hemisensory loss and left homonymous hemianopia. A repeat CT angiogram was suggestive of distal embolization related to a thrombus associated with the occluded left vertebral artery. She improved clinically and was discharged home on warfarin and clopidogrel. Two months later she was readmitted with a 7 day history of recurrent vertigo and mild left hemiparesis. Her international normalized ratio (INR) was 2.6. CT scan showed an old right occipital infarct. There was recanalization of the left vertebral artery at the level of the C4 vertebra. Coiling occlusion of left vertebral artery via right vertebral artery was performed in retrograde fashion under general anaesthesia. The procedure was uneventful and she made a full recovery. Warfarin was discontinued, but she remained on long-term antiplatelet therapy with clopidogrel. At one year follow-up she had no further events.

**DISCUSSION**

68%. We present a patient with recurrent posterior circulation transient ischaemic attacks in spite of full anticoagulation and antithrombotic treatment.

**Interesting and challenging cases**

**Isolated cerebral venous thrombosis in inferior sagittal sinus**

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Background and Significance: The superior sagittal sinus is the most common site where dural venous sinus thrombosis occurs. Isolated inferior sagittal sinus thrombosis (ISS) is very rare. We report a patient with inferior sagittal sinus thrombosis, involving bilateral corpus callosum.

Case: A 30-year-old female was admitted with headache and gait disturbance. T2-weighted images showed high signal intensities in corpus callosum, which were enhanced with gadolinium. Digital subtraction angiography showed thrombus in inferior sagittal sinus. Anti-coagulation was administered for one month and the symptoms disappeared. Follow-up MR scans revealed
left spastic hemiparesis equally distributed to the arm and leg. Frontal release signs were present. Laboratory findings were normal. Head CT disclosed cerebral atrophy and a spontaneous area of hyperdensity in the brainstem. MRI disclosed marked cerebral atrophy, and multiple lacunar infarction in cerebral and cerebellar white matter. Both ICA and VA were of the megavessel type as was shown on MRA. There was no junction between the 2 VA, so that there was no BA, and both VA were parent vessels for a huge AVM.

CONCLUSION: Association between AVM and megavessels of the 4 main cerebral arteries, creates special hemodynamic and rheologic conditions resulting in multiple ischemic lesions, disseminated through the cerebral and cerebellar white matter.

KEY WORDS: AVM, megavessels, lacunar infarction, leukoaraiosis.

Interesting and challenging cases

MEGAVESSELS ASSOCIATED WITH AVM IN A PATIENT WITH MULTIPLE LACUNAR INFARCTION AND PSEUDOBULBAR SYNDROME

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OBJECTIVE: As we did not find any published case of megavessels associated with AVM, we highlight the association between bilateral mega ICA and VA and a brainstem AVM, in a patient with early multiple vascular insults, resulting in young onset pseudobulbar syndrome.

CASE PRESENTATION: A 48 year old patient, heavy smoker and alcohol intaker, was admitted with a left hemiparesis that had a sudden onset during nighttime. 8 years ago he presented right hemiparesis and marked dysarthria. The patient was hemodynamically compensated, and presented a right spastic brachially predominant old hemiparesis, as well as a newly settled old hemiparesis, as well as a newly settled
Amnesia and Ebstein anomaly: a strange combination
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Background:
Ebstein’s anomaly is a rare congenital heart disease caused by adherence of dysplastic septal and posterior leaflet of the tricuspid valve into the right ventricular cavity. This leads to atrialization of right ventricle with ventricular dysfunction, enlarged right atrium and interauricular communication with right-left shunt. As a result, there is tricuspid regurgitation, right ventricular failure, cyanosis and cardiac arrhythmias.

Methods: a 45 year old male with no relevant medical history presented acute bradypsychia, dysarthria and axial ataxia secondary to multiple isquemic infacts in bilateral thalamus, right occipital lobe and left hippocampus. During his stay in the Stroke Unit the monitorization detected several paroxysms of atrial fibrillation. Transesophageal echocardiography revealed the presence of tricuspid dysplasia compatible with Ebstein’s disease and large interauricular communication type ostium secundum. As a sequel of the event, the patient has amnesia for recent events, diplopia and daytime sleepiness. He is under oral anticoagulation therapy with no recurrences.

Results and conclusions:
-Ebstein’s anomaly is a rare congenital
heart disease (0.3% of total)

- His appearance at an early age has a high mortality rate
- In adulthood, is associated with embolic events due to cardiac arrhythmias
- After an event, chronic anticoagulation is recommended
- Surgical treatment is reserved for symptomatic patients (cyanosis, dyspnea …)

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#### Thrombolysis in a snake bite: An unexpected situation


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**Background**

Ischemic strokes are seldom due to snakes bites. A few cases are reported in EU and USA, so the management of neurological deficits caused by snake bites may be problematic.

**Methods**

We present a case report of a 54 years old male, with an unremarkable medical past history, who was bitten by a snake while he was working in a mountainous region of León (north of Spain). It was identified by the own patient as Vipera Seonei. In the first hours he developed a local inflammatory reaction around the bitten area and 5 hours later a focal neurological deficit appeared. The clinical examination, the cranial CT and the transcranial doppler ultrasonography revealed infarction of the right middle Cerebral Artery territory (NIHSS 15).

Having had the analytical blood test including the blood coagulation test in the normal range, we decided intravenous treatment with rtPA, 4 hours after the neurological deficit had begun to show without clinical response.

16 Hours later, the patient had a clinical worsening corresponding to transtetorial herniation due to a hemorrhagic transformation, that is seen in a second cranial CT. A descompresive craniotomy is done with partial good recovery in the weeks after that.

**Results and Conclusions**

Althought most centers follow protocol treatments for the acute ischemic strokes, there could be singular situations in clinical routine, that may suppose a challenge for the clinician. We believe this case is a good example of this, being the first case of intravenous thrombolytic therapy in a ischemic stroke probably due to a snake bite.

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#### Subacute bilateral transverse sinus thrombosis masquerading as positional vertigo

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Cerebral venous sinus thrombosis (CVST)
Interesting and challenging cases

Paragangliomas: diagnosis after hemorrhagic stroke.
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BACKGROUND:
To describe a case of paragangliomas, with a hemorrhagic stroke as the main clinical manifestation.

METHODS:
We present a case report with clinical, laboratory, and histologic, details.

RESULTS:
We present the case of a 75 year old female, who was admitted to the emergency department, because of persistent dizziness that was aggravated by changes of head position commencing about twelve days before hospital admittance and accompanied by a subtle occipital headache. The patient, other than being in menopause since the age of 41, had a free family and clinical history. Her examination revealed horizontal left-beating nystagmus, hypoexcitability to caloric stimulation on the right side, elevated cerebrospinal fluid pressure (32 cm water) and moderate arterial hypertension (160/95 mmHg). The non-contrast cerebral computed tomography scan was normal. Magnetic resonance imaging and magnetic resonance venography showed thrombi in the right transverse/sigmoid and left transverse sinus. A thorough investigation was undertaken to exclude factors associated with CVST including immunological testing, coagulation factors and occult tumor screening. Two heterozygous mutations were discovered; C677T mutation of the methylenetetrahydrofolate reductase gene and A20210 mutation for prothrombin G. The patient showed improvement after anticoagulation therapy.

In conclusion CVST should be considered in patients with persistent vertigo combined with headache since prompt treatment can alter course and outcome.
complains, was referred to the Demyelinating Diseases Department by subjective complaints of memory, fatigue and brain MRI revealing confluent white matter lesions in the periventricular areas and in the centrum semiovale, extending to the corpus callosum, basal ganglia, thalamus, internal and external capsules and pons. She was first diagnosed with Multiple Sclerosis but after a full assessment, that diagnose was challenge. Given the suspicion of CADASIL (specially on MRI), genetic test was performed, despite no aura nor stroke events where recalled and a neuropsychological evaluation that showed a mild executive function deficit. A new pathogenic mutation, p.C168S, located in exon 4 of the NOTCH3 gene, was found.

Conclusion: The case described highlights a variability in the clinical manifestations of CADASIL and reports a new mutation. Despite being on the sixth decade of life, the patient has only a mood disorder and a mild executive function deficit (with no functional impairment) to account in the clinical CADASIL spectrum. Even within the family, stroke and migraine where missing. The mutation found was not described in the literature, despite being considered pathogenic.

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A less known stroke mimic: Posterior Reversible Encephalopathy Syndrome
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Background
Posterior reversible encephalopathy syndrome (PRES) is a neuro-radiological diagnosis which can complicate a wide range of conditions. Clinical features include headache, vomiting, altered sensation, disturbances of vision, seizures and focal deficits. We report a case of PRES in a 66-year-old man who presented to emergency department (ED) following a fall with loss of consciousness and left sided weakness.

Methods
A 66-year-old man with background history of subdural haematoma, ankylosing spondylitis, autonomic dysfunction, permanent pacemaker, ischaemic heart disease and essential tremor presented to ED following a fall and loss of consciousness. His medications included rosuvastatin, venlafaxine, fludrocortisone and midodrine. He had a strange feeling all over the body followed by hearing phone ring 4 hours later and then noticed left sided weakness. Examination revealed laceration on right scalp, blood pressure 155/99mmHg, heart rate 72 beats-per-minute, glascow coma scale 15/15, right facial droop and left arm drift. Two days later had left visual and hemi-body neglect, right facial droop, left arm drift and apraxia and myoclonic jerks of limbs.

Results
Non-contrast computed tomography (NCCT) brain scan revealed deep white matter changes in both occipital lobes with effacement of the sulci over the vertex in keeping with cerebral oedema. CT Brain with contrast day 2 showed low attenuation changes in the right cerebellar peduncle and white matter of both occipital poles and posterior parietal lobes. NCCT brain scan day 13 showed less extensive symmetrical low densities. His diagnosis was PRES secondary to severe autonomic dysfunction. He underwent extensive rehabilitation before discharge home.

Conclusion
This case shows the importance of recognising some of the less known stroke mimics. Early recognition and treatment of this syndrome prevents permanent brain damage.

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2 cases of TB meningitis with stroke sequelae
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We describe 2 patients that presented to our local stroke unit with preceding tuberculous meningitis (TBM) that was complicated with acute stroke. The first patient was a 68 year old Philippine woman, resident in the UK, who was unwell with disseminated tuberculosis (renal, miliary and TBM) and was on antituberculous treatment for 3 months before developing sudden right sided weakness and dysphasia. Her MRI brain revealed bilateral basal ganglia infarcts, basal meningeal enhancement and TB associated secondary hydrocephalus. The second patient is a 69 year Somali...
man who was resident in UK for the last 9 years. He was on treatment for tuberculous meningitis with cauda equina syndrome for the last 4 months. He had a ventriculoperitoneal shunt in situ for his TB complicated by hydrocephalus. He developed sudden right sided weakness and aphasia. His MRI brain confirmed several, small recent infarcts in the left frontoparietal lobes and in the right basal ganglia and right cerebellum with signs of basal meningitis.

Stroke in TBM is rendered its most serious complication and can occur in up to 30% of cases. Patients with TBM associated hydrocephalus are at increased risk of stroke and prognostically do worse. Other predictors of poor outcome are CSF leucocytosis and meningeal enhancement on brain imaging. MRI is the imaging modality of choice in detecting brain infarcts, typically revealing multiple or bilateral lesions in the territories of the middle cerebral artery perforating vessels.4 Anti-tuberculous chemotherapy appears to be relatively ineffective in preventing vascular complications, perhaps suggesting an immune mechanism.

DEEP CEREBRAL VENOUS THROMBOSIS: FOLLOW-UP AND NEUROIMAGING FINDINGS OF FOUR PATIENTS

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BACKGROUND: Deep cerebral venous thrombosis (DCVT) is a rare cerebrovascular disease that can affect all age groups. Although a small number of cases have been reported with atypical onset and good prognosis; rest of the patients with DCVT usually present with headache, neurologic deficits and seizures with some clinical presentations progressing to coma. DCVT outcome has been reported to be strikingly worse than other cerebral venous thrombosis.

PATIENTS AND METHODS: Clinical and neuroimaging findings and results five-year follow-up results of four DCVT cases, followed up between 2006-2011 at the Edip Aktin Stroke Unit (Istanbul Faculty of Medicine) were evaluated.

RESULTS: All patients were female, mean age was 46.2 ± 17.1 (33-75 years), mean follow-up duration was 42.6 ± 12.7 months (range: 20-50 months). Laboratory investigations were unremarkable for hereditary and autoimmune thrombophilic risk factors. Pregnancy in one patient, oral contraceptive use in 2 patients and hormone replacement therapy in 1 patient were determined to be the associated risk factors. All patients had
good recovery and remained symptom free during follow-up. In brain MRI, the most consistent finding observed in all patients were bilateral lesions in deep cerebral gray matter, which were hyperintense on DWI, iso-or hypointense and heterogeneous on ADC maps.

CONCLUSION: Prognosis of DCVT might be fairly good with early diagnosis and appropriate treatment, contrary to earlier reports. Neuroimaging findings of DCVT cases might be representing vasogenic edema caused by cerebral venous thrombosis rather than a true diffusion restriction resulting from tissue necrosis seen in arterial infarctions.

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Non-invasive Intracranial Pressure Monitoring with Transcranial Doppler in a Patient with Progressive Cerebral Venous Sinus Thrombosis

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Background-Assessment and management of intracranial pressure (ICP) remains important in both neurosurgical and neurological conditions and often determines clinical outcomes. But, continuous ICP monitoring can be achieved via invasive methods only. Ophthalmological examination of the optic disc can be used to assess ICP but cannot show real-time pressure changes. Transcranial Doppler (TCD) ultrasonography is a sensitive, non-invasive, bedside test and TCD derived pulsatility index (PI) correlates strongly with ICP for a reliable non-invasive monitoring.

Methods- We performed daily TCD to monitor ICP in a case of progressive cerebral venous sinus thrombosis and florid papilloedema. Serial changes in PI, clinical and ophthalmological findings were recorded.

Results- A 49-year-old Chinese male presented with two days’ history of new acute onset, severe, generalized headache associated with an episode of transient jerking of right upper limb. On examination, he was alert, afebrile, normotensive and had no focal neurological deficit. Visual acuity was normal but early bilateral papilloedema was seen. Brain magnetic resonance (MR) showed left occipital acute hemorrhagic infarction and MR venography confirmed thrombosis of sagittal sinus, transverse and sigmoid sinuses. Despite early intravenous anticoagulation, his headache, papilloedema and level of consciousness worsened. By day 4 he appeared obtunded and visual acuity reduced to 6/24. Repeat MR venogram revealed new venous infarctions with surrounding edema and extension of thrombosis into both internal jugular veins. Urgent endovascular thrombolysis with tissue plasminogen activator resulted in significant clot lysis and partial recanalization of right sigmoid and transverse sinuses. Over next 5 days, his level of consciousness improved and headache dissipated. He was switched to oral anticoagulation and discharged on day 33 with improved vision and papilloedema.

Conclusion- Indirect assessment of ICP with TCD may be used as a non-invasive
An MR brain (Image 2) showed at least 20 ring enhancing mass lesions throughout both hemispheres. Considerable vasogenic oedema surrounded each lesion. Cefotaxime, metronidazole and steroids were commenced following microbiology advice. Unfortunately he developed apnoeic episodes with a decerebrate posture on day 5. Retroviral testing for HIV was positive. Toxoplasmosis serology was negative. On day 6 he developed fixed and dilated pupils and died the following day.

Discussion

Infliximab, a tumour necrosis factor antibody, is increasingly being used for the treatment of inflammatory conditions such as rheumatoid arthritis and inflammatory bowel disease. There is debate in the UK as to whether all patients should be screened for HIV prior to starting treatment. Serious adverse reactions of infliximab include lymphoma, reactivation of Tb and demyelinating CNS disorders.

This case highlights the serious neurological side effects that clinicians should be aware of after infliximab therapy, especially when they mimic a stroke.

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Stroke-Like Symptoms in a Patient with Crohn’s Disease Following Infliximab Therapy

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Background

Biologic drugs have emerged as an important advance in the treatment of many inflammatory diseases. We present an interesting case of a gentleman who presented as a left hemisphere stroke. Having received Infliximab for Crohn’s disease, his neurological decline was rapid. He was subsequently diagnosed with HIV and 20 ring enhancing cerebral lesions.

Case Study

A 57 year old male presented with sudden onset right arm and right facial weakness. He had a past medical history of Crohn’s disease and had been treated for an exacerbation 5 days prior to admission at a different hospital. He received dexamethasone, azathioprine and infliximab. T-spot test for Tb, Hepatitis B and Hepatitis C tests were negative, prior to starting infliximab.

A CT Brain (Image 1) showed multiple areas of hypodensity in both cerebral hemispheres. The lesions showed mass effect and vasogenic rather than cytotoxic oedema. On Day 3, his GCS suddenly dropped to 6.
The patient was treated with acyclovir.

Conclusion

HSV2 can cause cerebral ischemic infarct

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**Spinal ischemic stroke following hemodialysis: clinical and radiological findings**

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Background and aims: Spinal cord ischemic strokes (SCI) may result from various pathologies. We aimed to describe the clinical and radiological features of SCI associated with hemodialysis.

Patients and methods. We reviewed the clinical and radiological characteristics of patients that suffered SCI during or within the first 24 hours after hemodialysis in 2011.

Results. Four patients were included (mean age 68 men). Three had preexisting severe atherosclerotic disease of the aorta, low cardiac output and low blood pressure. Two of the patients had concomitant pneumonia and another had completed antibiotic treatment for pneumonia 10 days prior to the SCI. All 4 patients developed painless paraplegia and lower limb hypoesthesia which appeared during dialysis and gradually worsened over the ensuing 24h. Neurological examination revealed flaccid areflexic paraplegia with a clear sensory level in all patients. A meticulous review of the blood pressures charts during the dialysis revealed that all patients were subjected to significant periods of hypotension during

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**HSV2 ENCEPHALITIS AS A CAUSE OF STROKE: A CASE REPORT**

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Introduction

Herpes simplex viruses type 1 and 2 (HSV1 and HSV2) and varicella-zoster virus (VZV) are human neurotropic viruses. These viruses can cause stroke due to vasculitis.

HSV2 is responsible for meningoencephalitis in neonates and meningitis in adults. Rarely HSV2 is responsible for encephalitis in adults and it is rare HSV2 encephalitis to be presenting as an ischemic infarct.

Case Report

A 45 year old man presented with confusion, fever and cognitive disorders. A CT scan of the brain showed a hypodence lesion in the left frontal lobe, 6mm in diameter. A lumbar puncture was performed and the CSF was pathological. The MRI of the brain showed a hyperintense lesion in T2 and Flair images in the left frontal lobe. The PCR was positive for HSV2.
However, no cases of severe, multi-territory infarcts resulting in malignant cerebral oedema have been reported in patients with atrial myxoma.

Case:
We present a case of a 45 year old right handed gentleman, who presented with a dense left-sided hemiparesis. His NIHSS score on arrival was 19 and subsequent treatment with IV thrombolysis undertaken at 145 minutes post-onset was largely unsuccessful. Day two post-stroke, our patient became confused and GCS was recorded to be 5/15. Urgent CT brain revealed midline shift, trans-tentorial herniation and established right sided temporo-parietal and occipital lobe infarction. He underwent an emergency decompressive craniectomy and intensive care monitoring.

6 days post-operatively he returned to ward level to commence rehabilitation and stroke work-up. This revealed the presence of a 3 x 1.2 cm friable mass in the left atrium. This was subsequently removed via open cardiac surgery and histology confirmed an atrial myxoma. In addition, our patient was found to have a right sided central retinal artery occlusion.

Conclusions:
The exact pathophysiology of stroke in patients with atrial myxoma is unclear. We propose two theories. It is possible that thrombo-embolism in patients with atrial myxoma may occur by (1) haematogenous spread of actual myxomatous substance causing infarction distally and (2) the presence of intra-cardiac masses, such as myxoma, result in thrombus formation, superimposed on the mass which subsequently embolizes causing infarction elsewhere.
Fibromuscular dysplasia (FMD) is a neither atherosclerotic nor inflammatory stenosing vasculopathy which usually involves renal and internal carotid arteries (ICAs). FMD is not a well-recognized cause of MMS, but both diseases have already been associated.

METHODS: We report a case of MMS associated to FMD and review the previously reported cases.

RESULTS: A 36-year-old woman with no past medical history had a first transient ischemic attack (TIA) in 1997. The magnetic resonance angiography (MRA) showed a proximal stenosis on the left middle cerebral artery (MCA). Other investigations were normal. Atherosclerosis was suspected. Despite antiplatelet treatment, she had recurrent TIAs in the following 3 years. In 1999, a first conventional cerebral angiography showed thrombosis of the left MCA, proximal stenosis of the right MCA and slight abnormal vascular network in the vicinity of the occluded left MCA. A MMD was evoked. The right MCA stenosis was successfully stented in 2000, and the frequency of TIAs dramatically decreased. A new MRA performed in 2011 showed bilateral thrombosis of ICAs and development of abnormal collateral vascular network while there was no clinical progression. In 2011, a new analysis of the successive CCAs performed previously revealed typical lesions of FMD from year 1999, leading to a final diagnosis of MMS caused by FMD. The association of FMD and MMS has only been reported in 4 adults so far but should probably receive more attention.

CONCLUSION: According to guidelines, FMD is not one of the conditions to be...
looked for in front of a moyamoya. This diagnosis could be considered before concluding to a MMD.

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Spinal subarachnoid hemorrhage caused by dissecting aneurysm of a radiculopial artery: to treat or not to treat?
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BACKGROUND: Spinal subarachnoid hemorrhage (SAH) is a distinct form of SAH much rarer than its counterpart in the brain. For several reasons, which includes a full range of possible etiologies, it poses as a challenge to diagnosis and its treatment strategy may be uncertain. Very rarely it is caused by the rupture of a local aneurysm, usually from a spinal artery.

METHODS: We describe a clinical case and detail its diagnosis and management.

RESULTS: A 59 yo man, with a past medical history of a meningioma under conservative treatment, which developed a rapid onset headache (worst of his life) in one day, followed by acute lumbar pain less than 24 hours later which took him to the ER. His physical examination revealed nuchal rigidity as well as other signs of meningism. Initial head CT was unremarkable and lumbar puncture revealed a grossly hemorrhagic cerebrospinal fluid with confirmed xanthochromia. A brain AngioCT and head and neck angiography were also unremarkable, what prompted for investigation of other possible bleeding sites such as the spine. Spine MRI was performed and led to the finding of an extensive subacute bleeding which involved multiple spinal cord levels, specially the thoracolumbar region. The patient was then submitted to a spinal angiography which revealed the presence of a dissecting aneurysm of a right posterior radiculopial artery of T10. As there was no motor involvement and the patient reported progressive improvement of his symptoms, based on reports of similar cases in the available medical literature, a wait-and-see strategy was adopted with repeating of the spinal cord angiography in a month. This new exam revealed complete resolution of the aneurysm, with probable spontaneous occlusion of the distal part of the artery.

CONCLUSION: Radiculopial artery aneurysms are a rare cause of SAH and their treatment generally involves a difficult decision. The wait-and-see strategy might be safe as supported by our case and others in literature.

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Intractable Hiccups Post Stroke: Why Does It Occur And How Do We Treat It?
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Background: Hiccups (singultus) are involuntary contractions of the diaphragm and external respiratory muscles followed by abrupt glottal closure producing the characteristic ‘hiccup’. Neurological substrate is lacking. We postulated a reflex arc of vagal
and phrenic afferents, a brainstem/cerebellar central processor and phrenic, anterior scalene and intercostal efferents. We present a 52 year old gentleman with bilateral cerebellar infarcts, who’s had intractable hiccups for 5 years. The cerebellum must be involved in this pathway. We reviewed literature on hiccups to revise this hypothesis and guide management.

Methods: We searched Medline, Pubmed, Google Scholar and the Cochrane Library for ‘hiccups’ (also ‘hiccoughs’ and ‘singultus’). Articles in English were reviewed with particular attention to aetiology, sequelae and treatment of intractable hiccups. Central nervous system cases were analysed and a neurological pathway for the hiccup phenomenon was constructed.

Results: Hiccups occurred in several central nervous system pathologies including stroke. Infarction site is variable and we found intractable hiccups in stroke affecting the brainstem, cervical cord, cerebellum, mid-brain, basal ganglia and insula. Successful treatment has been seen with homeopathy, and over thirty pharmaceutical agents. Invasive techniques including phrenic nerve block and vagal nerve stimulation are options in difficult cases.

Conclusion: The neurological explanation for hiccups is more complex than the aforementioned reflex arc and involves inhibitory control from the cerebellum and cerebral cortex (via the basal ganglia, figure 1). Stroke physicians should be aware that intractable hiccups can be a presenting feature or consequence of strokes affecting various central nervous system sites, causing significant morbidity for a patient and as in our case, providing a treatment challenge for the clinician, where despite extensive (including invasive) treatment, hiccups still persist.

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Multiple vascular lesions in a patient with angioimmunoblastic T-cell lymphoma: a case report.

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BACKGROUND:
Hematological disorders have been estimated to implicate approximately 1% of patients with arterial ischemic stroke. Angioimmunoblastic T-cell lymphoma (AITL) is a rare and complex lymphoproliferative disorder, first described in 1974. It is clinically characterized by widespread lymphadenopathy, extranodal disease, immune-mediated hemolysis and polyclonal hypergammaglobulinemia.

CASE REPORT:
We report the case of a 53 year-old man...
with AITL diagnosed a year ago and disseminated multi-organ extracerebral disease. He was treated with a 6-cycle CHOP chemotherapy scheme and then medicated with interferon alfa-2a and followed in hematologic cancer clinic.

This patient presented at our emergency department with a 3 day history of sudden onset of disarthria, lower extremities weakness and incoordination. Neurological examination: disarthria, right facial central palsy, slight right horizontal gaze palsy, right hemiparesis 4, right hemiataxia as well as gait ataxia and bilateral extensor plantar responses. There were no signs of meningeal irritation. Head computed tomography revealed a hipodensity in left semioval center, consistent with a recent ischemic lesion. He was admitted to the neurological ward for further investigation. Cerebrospinal fluid examination was negative for infection and on histological analysis there were not suspected malignant cells.

During in-patient care, there was an aggravation of the neurological status with excessive somnolence, dysphagia, worsening of dysarthria and right hemiparesis G1. Brain MRI confirmed multifocal lesions (hipointense in T1, hiperintense in T2 and with restricted diffusion signal) in relation with distal vessel occlusion in mutiple vascular territories.

**DISCUSSION:**

The most common cerebrovascular complication of lymphomas is thrombosis of cortical veins and sinus. Rarely, arterial ischemic lesions have been also reported in litterature. Multiple ischemic mechanisms have been implicated in the pathogenesis.

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**Fanconi’s anemia associated with cerebral venous sinus thrombosis**

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Background: Fanconi’s anemia is an autosomal recessive disorder associated with hematologic abnormalities such as bone marrow failure, thrombocytopenia, myelodysplastic syndrome or acute myeloid leukemia and congenital malformations including aplasia of the radius and thumb, genitourinary tract abnormalities, and cardiac malformations. Central nervous system abnormalities such as cerebral arterial malformations, abnormal pituitary, absent septum pellucidum, Arnold-Chiari malformation and Moyamoya are also associated with Fanconi’s anemia. Cerebrovascular complication in Fanconi’s anemia is very rare.

Case Report: A 19-year-old woman with Fanconi’s anemia visited to our hospital due to severe headache for 3 days. On admission, the vital signs were stable. Physical examination showed short stature, microcephaly, microtia of the right ear, scoliosis, polydactyly of the right hand, and café-au-lait spots on trunk and back without mental retardation. She had no evidence of any neurological deficits including neck stiffness. Complete blood count revealed WBC 5,600/µL, hemoglobin 7.6 g/dl and platelet 151,000/µL. Protein C activity and coagulation factor VIII and factor XI were high. On lumbar puncture, the opening pressure was 22 cmH2O. Brain CT demonstrated
focal increased density along the straight sinus. Diffusion-weighted images showed high signal intensities in the right thalamus and bilateral basal ganglia. MR venography revealed absent flow of the vein of Galen, straight sinus and left transverse sinus. She was diagnosed cerebral venous sinus thrombosis.

Conclusions or Comments: We believe our case to be the first describing about development of cerebral venous sinus thrombosis in Fanconi’s anemia. We suggest that the possibilities of cerebral venous sinus thrombosis occurring in Fanconi’s anemia are an underlying vascular anomaly and coagulopathy.

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Excellent early clinical outcome in right hemispheric infarction despite markers of a poor prognosis on computed tomography

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Objective: To report the excellent clinical outcome of acute carotid T occlusion after combined intravenous (IV) thrombolysis and intraarterial (IA) thrombectomy despite early post interventional computed tomography (CT) indicating a poor prognosis.

Background: Stroke due to an acute carotid T occlusion has a poor functional outcome. Early recanalisation (<300 minutes) and higher Alberta Stroke Program CT Scores (ASPECTS) in the initial CT predict a better prognosis. In subacute CT, large hypodensities and ASPECTS values below 6 indicate persistent functional deficits.

Case Report: A 56 year-old woman was admitted with somnolence, left sided hemiplegia and severe hemineglect. IV thrombolysis was started 90 minutes after onset. As duplex colour-coded sonography revealed a right carotid T occlusion, IA thrombectomy was performed, achieving complete recanalisation after 210 minutes after onset. Although the initial ASPECT score of 7 and the early recanalisation indicated a good prognosis, the patient remained somnolent and hemiplegic. CT on days 2 and 3 showed large hypodense areas of the right striatum, the insular and frontal cortex, a compressed right lateral ventricle and a midline shift of 4 mm (ASPECTS 3). But on day 8, the patient markedly improved when she became more vigilant, moved her left arm and leg, and started to walk with assistance. The hemineglect persisted. Magnetic resonance imaging on day 12 demonstrated faint FLAIR hyperintensities with T2 hyperintensity shining through in DWI, corresponding to the CT hypodensities, however T1 signal was almost unchanged. At discharge (day 15), she was able to walk unaided and used her left hand for object manipulation.

Discussion: CT is very valuable in the acute
management of stroke, but needs cautious interpretation in the post acute phase. Not all areas of hypodensity indicate completed infarction. In our patient, the CT hypodensity was probably due to partially reversible edema after early recanalisation.

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**MOYAMOYA AS ISCHAEMIC STROKE**

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BACKGROUND:
Moyamoya disease (MMD) is a rare idiopathic occlusive cerebrovascular disorder characterized by progressive stenosis or occlusion of the distal internal carotid artery and proximal cerebral arteries with an extensive network of cerebral collaterals. It is more prevalent in Asians especially in Japan and Korea. However we present case details of patient with Indian origin who has admitted with recurrent strokes.

METHODS & RESULTS:
This was a 34 year old gentleman who initially presented with right hemi paresis and subsequent CT head showed left middle cerebral artery territory infarct. He was commenced on antiplatelets and he recovered completely from the event. He presented again after few months with new onset of right hand weakness after non compliance to his antiplatelet therapy. His investigations including CT and MRI brain confirmed Left middle cerebral artery infarct. Patient then underwent CT angiography which showed severe narrowing of the middle cerebral arteries as well as anterior cerebral arteries bilaterally and evidence of fine collateral vascularity surrounding the terminal internal carotid arteries. The appearances are in keeping with Moyamoya type syndrome. The investigations done including CSF analysis and vasculitic screen do not suggest any inflammatory process.

CONCLUSION:
This case highlights the importance of recognising the rare Moyamoya disease as cause of ischaemic stroke in south Asian population.

**Ischemic stroke, Down’s syndrome and sinus of Valsalva aneurysm**

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Background: There have been very few case reports implicating an aneurysm of the sinus of Valsalva in ischemic stroke. Sinus of Valsalva aneurysm (SOVA) has also very rarely been reported in Down’s syndrome. We report a patient with Down’s syndrome and a minor stroke in whom an aneurysm in the right sinus of Valsalva was identified.

Case Description: A 43 year old woman with Down’s syndrome and a history of treated hypothyroidism presented to hos-
to the hypercoaguable state; thrombosis is usually venous. Arterial thromboses, while recognised, are rare. Free-floating thoracic aortic thrombi can develop in the absence of atherosclerotic disease in hypercoaguable states. Such thrombi can embolise causing peripheral or cerebral ischaemia. We report a patient with ulcerative colitis (UC) who presented with middle cerebral artery (MCA) occlusion caused by embolism from aortic thrombus.

Case report
A 66-year-old male, recently discharged from hospital after a flare of UC, presented 3.5 hours after sudden onset of right-sided hemiparesis, visual and sensory inattention. The patient also reported a further flare of colitis with frequent watery stools. Computed tomography (CT) imaging of the brain and CT angiogram of the aortic arch, extra-cranial and intra-cranial vessels was performed. CT brain showed early ischaemic changes in left MCA territory. CT angiography showed left MCA occlusion and a filling defect in the aortic arch in keeping with thrombus. Transthoracic echocardiogram showed no intraventricular thrombus. The patient was commenced on intravenous heparin and intravenous steroids. No further arterial occlusive events occurred and his colitis settled. After five days he was switched to oral anti-coagulation and steroids and transferred to a rehabilitation setting.

Discussion
The thoracic aorta is a relatively uncommon site for thrombus formation and arterial thromboses are rare complications of ulcerative colitis with a pathogenesis that is not completely clear. This combination in a hospital one week after developing right arm weakness. There was no dysarthria or language difficulty noted. Examination confirmed right arm weakness. CT scan of brain revealed low attenuation superiorly in the left frontal lobe consistent with established infarction. Routine blood investigations were unremarkable (fasting glucose, full blood count, lipid profile). Carotid Dopplers demonstrated a tortuous left internal carotid artery but no stenosis. Velocities were normal. Vertebral arteries revealed normal antegrade flow. A transthoracic echocardiogram with bubble contrast demonstrated a small localized right SOVA. No abnormal flow or shunt identified. Follow-up at one year revealed no change. Clinically the patient remained well on a statin and antiplatelet therapy.

Discussion: SOVAs have been reported in just six patients with ischemic stroke and appears to be another possible cause of ischemic stroke. Like our patient, most of the published case reports of patients with SOVA and ischemic stroke have had a right SOVA.

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Middle cerebral artery occlusion secondary to aortic thrombus in active ulcerative colitis
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Introduction
Thrombosis is a recognised complication of inflammatory bowel disease (IBD) due to the hypercoaguable state; thrombosis is usually venous. Arterial thromboses, while recognised, are rare. Free-floating thoracic aortic thrombi can develop in the absence of atherosclerotic disease in hypercoaguable states. Such thrombi can embolise causing peripheral or cerebral ischaemia. We report a patient with ulcerative colitis (UC) who presented with middle cerebral artery (MCA) occlusion caused by embolism from aortic thrombus.

Case report
A 66-year-old male, recently discharged from hospital after a flare of UC, presented 3.5 hours after sudden onset of right-sided hemiparesis, visual and sensory inattention. The patient also reported a further flare of colitis with frequent watery stools. Computed tomography (CT) imaging of the brain and CT angiogram of the aortic arch, extra-cranial and intra-cranial vessels was performed. CT brain showed early ischaemic changes in left MCA territory. CT angiography showed left MCA occlusion and a filling defect in the aortic arch in keeping with thrombus. Transthoracic echocardiogram showed no intraventricular thrombus. The patient was commenced on intravenous heparin and intravenous steroids. No further arterial occlusive events occurred and his colitis settled. After five days he was switched to oral anti-coagulation and steroids and transferred to a rehabilitation setting.

Discussion
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as well as lengthened toward the mouth, which looks small and round in shape.” Her description of how she saw faces seemed as if viewed through a convex lens. She had no prosopagnosia; when presented with images of ten famous faces she was able to readily identify all of them, and she could correctly recognize images of objects. She had no impairment in her visuoperceptual performances (describing a complex scene, drawing figures, reading and writing) or in color perception. Other components of the neurologic examination were normal. She had no cognitive or psychiatric impairment. Diffusion weighted MRI and T2-weighted brain MRI revealed an infarction in the right medial temporooccipital lobe, including the parahippocampal gyrus.

Discussion
In the light of recent empirical evidence, face perception is thought to be mediated by a distributed neural system including all regions of the core and extended systems of which the major entry node is the lateral fusiform gyrus. We speculated that any injury on this pathway could bring about prosopometamorphopsia involving whole or unilateral face perception, or very rarely, such as in our case, distortion restricted to the central area of the face.

Furthermore, we hypothesized that there could be topographical correspondences between facial structure and the fusiform face area.

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A case of prosopometamorphopsia restricted to the nose and mouth with right medial temporooccipital lobe infarction, including the fusiform face area

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Background
Metamorphopsia includes a broad spectrum of visual perceptual distortions, such as alteration of perceived object size or, rarely, altered perception of faces, termed prosopometamorphopsia. Recent empirical evidence has revealed that face perception is mediated by a distributed neural system, and its major entry node is the lateral fusiform gyrus.

Case
A 75-year-old right-handed woman was admitted for a sudden case of nausea, dizziness, and blurred vision. She complained of dimmed vision, and the central part of faces, particularly the nose and mouth, appearing out of shape. Regardless of whether she looked at a familiar or an unknown person, she claimed, “The nose looks very narrow
Case 2: A-85 year’s old man presented with TIA of unknown etiology. Baseline MRI revealed a left frontoparietal sulcal hyperintense lesion in F.L.A.I.R. sequence with enhancement in T1. On 5th day control MRI, a new cortical punctate DWI lesion and extensive superficial siderosis were seen. One year later sulcal lesion disappeared and a new microbleed was visible in the right temporal cortex.

Case 3: A-70 year’s old man presented with TIA of unknown etiology. Baseline MRI showed a right parietal sulcal hyperintense lesion in F.L.A.I.R. sequence, showing enhancement in T1 and few cortical microbleeds and foci of hemosiderosis. A new cortical punctate DWI lesion appeared in the same location 4 days later. A new silent sulcal lesion appeared in the right temporooccipital region with a new DWI lesion in the occipital region, the previous parietal lesion had disappeared in 3rd month MRI. New cortical microbleeds were detected ten months later.

Conclusion: Our cases indicate that contrast-enhanced leptomeningeal lesions may be seen in TIA or minor ischemic strokes patients of unknown etiology. This evolving cortical ischemic vasculopathy may add to the clinical spectrum of contrast-enhanced leptomeningeal lesions previously described as part of rapidly progressive encephalopathic CAA.
Background
This is an abstract for a case of a 59 year old gentleman admitted under the Stroke team at Russell’s Hall Hospital with Stroke symptoms, and then transferred to the Neurosurgical team at Queen Elizabeth Hospital Birmingham with a Stroke mimic. He presented to A&E with acute onset right sided weakness/dysphasia which had been getting worse. He had been feeling generally unwell prior to this and had been noted to have a sneezing episode 2 days previously.
He had previously had a significant head injury in 1969 that was managed conservatively. He had 2 seizures in the past and following this was commenced on Carbamazepine. He had previously had a CT head and MRI brain which were reported as being normal.
Based on his presentation he was given Aspirin 300mg and referred to the Stroke team. His power was graded at 2/5. He gradually improved over the next few days. A CT scan revealed a large volume of intracranial air in the left frontal region. He was then transferred to Neurosurgery.
His power at this point was noted to be Grade 4/5 on the right side. Repeat CT revealed a large amount of air in the left frontal lobe with associated mass effect leading to distortion of the left frontal horn of lateral ventricle. Defects were noted in the roof of the ethmoid and frontal sinus, presumed to be old fractures.
In light of the above findings he underwent left frontal twist drill hole under GA. Aspiration of air was performed successfully using a Dandy cannula.
He initially had an uneventful recovery and post-op imaging revealed a slight decrease in the volume of intracranial air. His GCS returned to 15/15.
He was unfortunately found unresponsive and CPR was unsuccessful. Post-mortem revealed the gentleman had a pulmonary embolus.
Conclusions
This case highlights the importance of rare Stroke mimics (Pneumoencephalocoele) presenting with acute Stroke-like symptoms. Early recognition and Neurosurgical intervention is essential in cases such as this.

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Carotid Endarterectomy or Carotid Artery Ligation for Stroke Prevention?
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We present a challenging case of a 68-year-old man who sustained a stroke and required difficult management decisions.
Case report:
A 68-year-old ex-smoking man with type II diabetes, hypertension and hypercholesterolemia, presented in October 2010 with a 12-hour history of right-sided weakness and dysphasia. He described two previous similar episodes in September 2010. A CT-head confirmed an evolving stroke in the left MCA territory.

Carotid Doppler ultrasound and CT-Angiography demonstrated an occluded left internal carotid artery (ICA) and >85% stenosis on the asymptomatic right side. Clopidogrel and Simvastatin were added to his usual regime. He was considered for, and received, a carotid endarterectomy (CEA) on the asymptomatic side as a primary prevention measure. He made an uneventful recovery and was discharged.

A month later, he represented with a 2-hour recurrence of right-sided weakness and dysphasia. Reassessment of his carotids showed the symptomatic side had re-cannulated with trickle blood flow but still had a 99% stenosis. A repeat CT-head showed a further frontal lobe infarct. His statin therapy was increased, but the stenosis was too severe and extended intra cranially therefore not suitable for CEA.

Two weeks later, he was admitted with recurrence of the symptoms. Although maintaining minimal flow the symptomatic artery remained inoperable, however the degree of atherosclerosis suggested an embolic aetiology originating in the diseased artery. The only option that presented was internal carotid artery ligation. This was performed, and he was discharged and has remained well since.

Discussion:
ICA ligation is an unusual technique to treat severe carotid artery stenosis that extends intra cranially. It is considered where an embolic aetiology is suspected, but the stenosis is too severe and high to consider CEA. We plan to discuss the role of the different assessment techniques including CT angiography, carotid Doppler and transcranial Doppler. It also emphasizes the importance of a multidisciplinary approach to stroke management.

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A multifocal synchronous glioblastoma revealed by stroke like syndromes- case report and neuroradiologic findings
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Background: Multifocal glioma is a rare form of intracranial neoplasm; 2-5% of the brain tumors are synchronous independent tumors. Presentation of glioma with stroke like features is uncommon; the typical symptoms are seizures or focal neurological deficit.

Case Report: A 66-year-old male, with a medical history of hypertension, mitral valve repair and hyperlipemia, admitted for acute speech difficulty. One week before, he reported an episode of dyslexia. Brain MRI revealed a wedge-shape area of restricted diffusion, T2 hyperintense in the left parietal region; no abnormalities on MRA, compatible with subacute infarct in the territory of posterior left middle cerebral artery. Atrial fibrillation was detected two days later and warfarine was started.
Interesting and challenging cases

MASSIVE PULMONARY THROMBOEMBOLISM AFTER INTRAVENOUS STROKE THROMBOLYSIS

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Introduction: Several cases of concomitant pulmonary embolism (PE) and ischemic stroke and an ischemic stroke following PE have been described in the literature. Herein, we present a patient with a massive PE after intravenous (IV) thrombolysis for an ischemic stroke.

Case report: A 76-year-old female with high blood pressure and hypercholesterolemia as cerebrovascular risk factors, was admitted on the 2nd of July 2009 due to a sudden right leg paresis at 9:30 am with the diagnosis of ischemic stroke. The patient received IV thrombolysis with a progressive neurological improvement. She was asymptomatic at 48 hours and she was transferred to the Neurology Department where anti-thrombotic treatment was initiated (ASA...
Background: Cerebral venous thrombosis can manifest in various clinical forms, especially when concerning the deep venous system causing bithalamic lesions. We report an observation with a pseudopsychiatric case revealing a deep venous thrombosis complicated by a bithalamic hemorrhagic infarction. Methods: A 36 years old man with a depression treated by benzodiazepine was found in his apartment, with major psychomotor slowing, confusion and memory loss. Due to his medical record, he was first diagnosed a melancholic depression by the emergency doctors. Fortunately the psychiatrist who examined the patient rejected this diagnosis and asked for a CT-scan. The cerebral CT and then the MRI showed an asymmetric bithalamic hemorrhagic infarction which was more important in the left thalamus. The phlebography revealed a thrombosis of the left thalamic vein, the internal cerebral veins, the vein of Galen and the sinus confluence. Results: CSF showed 10 cells, total protein of 0.7 and a normal glucose level. HSV PCR was negative. A full-body exam, tumor markers, a full-body scan and a PET-scan showed no sign of cancer or local infection. Despite the anticoagulant treatment, a venous doppler ultrasound showed an extension of the thrombosis to the intern jugular vein. A neuropsychological exam showed some severe memory disorders which were more important in the language area than the visual area which corresponded to the anatomic lesions. The assessment of thrombo-
hypoesthesia under D12-L1 level and no meningismus. On admission INR was 3.7 and the lumbar sacral CT demonstrated an extensive subarachnoid hemorrhage from D6 to the end of tectal bag that deviated the spinal cord, with no detectable origin. MRI revealed subarachnoid hemorrhage in the cerebral sulci and peri-mesencephalic cistern associated with intraventricular blood. There was also evidence of epidural hematomas with different temporal evolution from pre-pontic region to L1, associated with pronounced spinal cord compression, and lumbar intra-medullar hemorrhage. The patient died 5 days after admission without complete etiological investigation.

Discussion/Conclusion: Spinal cord hemorrhage is a rare but dangerous complication of anticoagulant therapy. It must be suspected in any patient taking anticoagulant agents who complains of local or referred spinal pain associated with limb weakness, sensory deficits or urinary retention. Note-worthy in this case is the extension of the hemorrhage taking in account that the patient was anticoagulated slightly above the therapeutic range and the history of minor trauma.

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Major cerebral and spinal cord hemorrhage: case report
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Introduction: Subarachnoid hemorrhage (SAH) of spinal origin is a rare entity accounting for approximately 1% of all cases of SAH. Its most frequent causes are trauma (e.g. lumbar puncture), vascular malformations or bleeding diatheses/anticoagulation. Its onset is usually sudden and painful, causing myelopathic signs and symptoms. Case Report: A 80 year-old male experienced sudden back discomfort in the lumbar area and two days latter fall and have a slight head trauma. Three days later he wakes up with paraplegia and urinary retention. There is a history of frequent falls and anticoagulation with warfarin (auricular fibrillation). In a more detailed examination, there was algic and palesthesic hypoesthesia under D12-L1 level and no meningismus. On admission INR was 3.7 and the lumbar sacral CT demonstrated an extensive subarachnoid hemorrhage from D6 to the end of tectal bag that deviated the spinal cord, with no detectable origin. MRI revealed subarachnoid hemorrhage in the cerebral sulci and peri-mesencephalic cistern associated with intraventricular blood. There was also evidence of epidural hematomas with different temporal evolution from pre-pontic region to L1, associated with pronounced spinal cord compression, and lumbar intra-medullar hemorrhage. The patient died 5 days after admission without complete etiological investigation.

Discussion/Conclusion: Spinal cord hemorrhage is a rare but dangerous complication of anticoagulant therapy. It must be suspected in any patient taking anticoagulant agents who complains of local or referred spinal pain associated with limb weakness, sensory deficits or urinary retention. Note-worthy in this case is the extension of the hemorrhage taking in account that the patient was anticoagulated slightly above the therapeutic range and the history of minor trauma.

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Acute carotid artery stenting for dissection: mechanism guiding management
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Background: Carotid dissections are not an uncommon presentation in neurological practice. Often management is straightforward despite the ongoing debate regarding medical management.

Methods: Case report.

Results: A 55 year old right handed male presented with a left Horner’s syndrome, fluctuating right hemiparesis and expressive dysphasia. CT angiography confirmed a distal left internal carotid artery dissection. Anticoagulation was initiated with Enoxaparin with a view to longer term warfarinisation. On discharge, the patient had an isolated left Horner’s syndrome and remained neurologically stable for 4 days before presenting with fluctuating expressive dysphasia and a right hemiparesis. Aspirin 300mg was added to anticoagulation and catheter angiography identified tapering of the left internal carotid artery within its upper cervical segment before an abrupt occlusion just proximal to the laceral segment, suspicious of an intramural thrombus. There was no flow into the left hemisphere via an anterior communicating artery and only minimal flow through the posterior communicating artery resulting in an essentially isolated hemisphere. Serial MRIs demonstrated evolving areas of watershed infarction on a background of global hypoperfusion of the left anterior circulation despite maximum medical management and in the context of ongoing neurological deterioration. Emergency carotid artery stenting was performed to restore left hemispheric perfusion, resulting in stabilisation and improvement notably in speech over several days with the patient achieving a modified-Rankin score of 2 three weeks following the procedure, having scored 5 prior to intervention.

Conclusion: Not all deterioration in the setting of dissection is embolic in aetiology and it is important to be vigilant for alternative mechanisms such as hypoperfusion, particularly in those with an isolated hemisphere. Clinical examination may appear incongruous with radiological findings in the setting of hypoperfusion. A multidisciplinary approach, with the early involvement of Interventional Neuroradiology may provide further therapeutic options in this scenario.

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One in a Million – Thrombotic Thrombocytopenic Purpura (TTP) presenting as an Acute Stroke, Moschcowitz Syndrome

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Introduction: TTP affects 1-3 per million and without effective treatment can be fatal. It presents with neurological symptoms, thrombocytopenia, fever, renal impairment and haemolytic anaemia. It is a very rare cause of stroke in the older person.

Methods: Case report, clinical, radiological and laboratory findings.

Results: An 82 year old man presented with increasing confusion and unsteadiness having previously presented to Accident and Emergency 4 days earlier with transient neurological symptoms. He was under the
dermatologists for cutaneous vasculitis. On examination he was febrile and confused with a widespread purpuric rash. His platelet count was 31; antiplatelets were not started due to the risk of bleeding. His hematological markers worsened and a diagnosis of acquired TTP was confirmed after a haematology consultation. He was transferred to the renal unit for plasma exchange but unfortunately he deteriorated and developed a right hemiparesis and dysphasia. A repeat CT brain scan showed bilateral infarction of the cerebral hemispheres as well as haemorrhagic conversion on the asymptomatic side (probably secondary to therapeutic LMWH for presumed PE). He remains confused at times and is now on the rehabilitation unit fully dependent. Conclusion: TTP causes microangiopathic thrombosis leading to infarction of small and large vessels resulting in neurological symptoms including stroke when affecting the cerebral vasculature. Decisions regarding antiplatelet and anticoagulant medication is difficult as this condition is pro-thrombotic however as in this case there is an increased bleeding tendency.

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Pulmonary Vein Thromboembolism with Stroke as First Manifestation of Bronchial Carcinoma
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Background: Strokes are often caused by emboli of cardiac or arterial origin. Other sources of embolism such as deep venous thrombosis with paradoxical embolism are occasionally found in stroke work-up, but other sources are rarely discovered. We report two cases with a confirmed pulmonary vein source of their embolic strokes. Methods: Case report. Results: Two previously healthy patients without traditional cardiovascular risk factors apart from a history of smoking and a clearly embolic stroke pattern on MRI were evaluated at our institution. Transesophageal echocardiography (TEE) showed a mass in the pulmonary veins protruding into the left atrium of the heart. Contrast-enhanced multislice computed tomography of the thorax delineated a lung tumor with thrombotic material infiltrating the pulmonary veins. Transbronchial biopsy led to the diagnosis of a small cell lung cancer in one patient and a squamous cell lung cancer in the other. Embolisation of thrombotic material or tumor cells from the pulmonary veins was considered to be the etiology of stroke. Other stroke causes could be ruled out. Conclusion: A pulmonary vein source of embolism is rare and may be considered, when routine work-up is negative in embolic stroke. Tumor infiltration of the pulmonary veins leading to embolic stroke can be the first manifestation of bronchial carcinoma, as it was the case in our patients.

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Collateral damage: it is time to distinguish between the good and bad collat-
eral arteries.
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Background: Bilateral internal carotid artery occlusion (BICAO) have variable prognosis depending upon the patency of willisian collaterals and external carotid artery collaterals (ECAC). We describe a lady with BICAO with aberrant collateral arteries as result of angiogenesis.

Case report: A 58-year-old-lady presented with sudden onset difficulty in speaking of 7 hours duration. Two month prior developed painless loss of vision in her right eye diagnosed as central retinal artery occlusion this was followed by painful redness and persistent vision loss after a month, was treated as neovascular-uveitis. She had recurrent hemispheric TIA over last 9 years and was diagnosed to have BICAO 7 years ago. The CT head revealed a acute hemorrhage in the left thalamus. Catheter angiography (CA) demonstrated reconstitution of the bilateral terminal ICA by the ECAC via its branches. An unusual rete of tangled and corkscrew cortical arteries between the posterior cerebral artery (PCA) and anterior circulation (AC) was seen. The thalamoperforate and thalamogeniculate arteries were hypertrophied. The collateralization had progressed as compared to the interval CA. Diamox challenge MR perfusion scan showed reduce vascular reactivity and TCD showed lower pulsatility index in AC suggesting persisting ischemia.

Discussion: The mechanism of recruitment of cerebral collateral circulation during acute period is multifactorial. It is dependent on the pressure gradient, autoregulation and changes in the interstitial milieu. In the chronic phase these factors still play a role but in addition there is arteriogenesis and angiogenesis. Arteriogenesis is changes in the vessel wall whereas angiogenesis is the formation of new vessels which are remodelled over a period of time to form major supplying arteries.

Conclusion: Not only arteriogenesis but angiogenesis is part of response to chronic hypoxia. Occasionally these new collaterals could be a source of hemorrhage as in our patient.
Bilateral posterior cerebral artery steal as a form of subclavian steal syndrome.

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Background:
Visual disturbances are an uncommon manifestation of subclavian steal syndrome.

Methods:
A 65 year old man complained of unsteadiness for the last 24 h. He also had seen complex figures and image distortion (“the wall was bent” and he saw “geometric shapes and human faces he didn’t recognize…”). His past medical history included hypertension, diabetes, hypercholesterolemia, ischemic heart disease and peripheral vascular disease. He was taking aspirin, simvastatin, bisoprolol and pentoxifylline. At the emergency room, blood cell count and electrolytes were normal, EKG showed sinus rhythm and the CT scan was unremarkable for vascular lesions. In the physical examination there were no neurological disturbances other than gait unsteadiness, being unable to perform heel-to-toe maneuver. Blood arterial pressure was 85/55 mm Hg on the left arm and 111/60 on the right.

Results:
Doppler ultrasound study disclosed an asymmetry between both humeral arteries. There weren´t significant stenosis in both internal carotid arteries. The right vertebral artery was occluded and the left vertebral artery had a reversed flow during systole, suggestive of subclavian steal syndrome. Intracranially, both posterior cerebral arteries showed oscillation after tapping of either common carotid arteries. Hyperemic maneuver using a pressure cuff on the left arm caused both systolic and dyastolic velocity reduction at both posterior cerebral arteries. At that moment the patient described complex figures as he had seen before. An EEG was performed along hyperemic maneuver without showing epileptic activity. Brain MRI showed watershed cerebellar ischemic lesions between posterior inferior and superior cerebellar arteries but not occipital lesions.

Conclusions:
Visual disturbances in a patient with arterial vertebrobasilar pathology can be caused by bilateral posterior cerebral artery steal phenomena. Subclavian steal syndrome can involve both posterior cerebral arteries.
Background: Given the rarity of posterior spinal arteries infarction (PSAI), our knowledge of its clinical features remains poor.

Objective: To report 3 diffusion-weighted imaging proven PSAI cases and conduct a systematic review of the clinical features of PSAI.

Methods: We sought for published cases of pure PSAI using MEDLINE. Only MRI- or histologically-proven cases were included. Clinical data including sex, age, type of onset, type and severity of sensory, motor, bladder/bowel dysfunction and outcome were extracted by one reader, using a standardized form. Favorable outcome was defined as an ability to walk without assistance or with one aid.

Results: Clinical data were available for 62 patients, including the 3 cases that we observed. 51 cases were MRI-proven and histological examination was available in 12. Mean age was 59±15 yrs. Most cases presented an acute onset, but only 18/35 (51%) reached maximal deficit within 1 hour. All patients had sensory involvement, often with prominent posterior column dysfunction. 22/28 (79%) had spinothalamic sensory dysfunction, 52/56 (93%) motor impairment, 16/48 (33%) neuropathic pain, and 28/55 (51%) bladder/ bowel dysfunction. PSAI was bilateral in 34/62 (55%) cases and more frequently localized at the C1 to C3 level (13/42, 31%) or below T8 (19/42, 45%). Favorable outcome was observed in 37/52 (71%) cases.

Conclusion: Most PSAI occur at the lower thoracolumbar or at the upper cervical lev-
Prominent posterior column dysfunction is almost always observed. Motor impairment, but also spinothalamic hypoaesthesia, are much more frequent than expected. This could hardly be solely explained by initial spinal edema and rather suggests that in most patients, the territory fed by the posterior spinal arteries encompasses the posterior columns, but also the posterior horns and an important part of the lateral column. Favorable outcome is frequent and can even be observed in half of the patients with initial severe motor deficit.

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**Pulmonary Haemorrhage Secondary to Thrombolysis Therapy for Acute Ischaemic Stroke: A Case Report**

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Thrombolysis with alteplase is regarded as the most appropriate initial treatment for ischaemic stroke by the National Institute of Health in their most recent guidelines for the UK. Nonetheless, this therapy is not without its own risks, with symptomatic intra-cerebral haemorrhage being the most common, and serious, adverse event. However, we present a rare case of pulmonary haemorrhage secondary to the use of thrombolysis in a 48 year old previously well female patient.

She presented with a sudden onset of left sided weakness with an NIHSS of 10, and a CT head showing no evidence of intra-cerebral haemorrhage. She was therefore thrombolysed with alteplase 2 hours after onset of symptoms. Less than 24 hours post treatment she started to develop a swinging pyrexia, urine positive haematuria and new patchy infiltrates on her chest x-ray. A vasculitic screen was negative, but a CT thorax and transfer factor studies later confirmed evidence of pulmonary haemorrhage, concluded to be secondary to thrombolysis. The patient was managed conservatively and made a full neurological and respiratory recovery.

A literature search on the topic revealed only one previously reported case of pulmonary haemorrhage secondary to thrombolysis for stroke, which resulted in the death of the patient. It has also only been reported rarely following thrombolysis for acute MI, with underlying lung pathology being a major risk factor (for example, heart failure, smokers, prolonged CPR).

Classical presentation in these patients included a drop in haematocrit, haemoglobin and alveolar infiltrates on x-ray, all of which were demonstrated in this case.

This report highlights the need for clinicians to be aware of the possible side effects of therapies given, and the need for vigilance with regards to pulmonary haemorrhage.

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**Biopsy-proven fulminant primary cerebral angiitis with normal arteriography, presenting with recurrent strokes.**

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A 74-year-old patient presenting with left hemiparesis underwent a brain MRI showing multiple recent ischemic lesions. Thorough work up excluded systemic autoimmune or infectious disease, thrombophilia, whereas cardiologic examinations and brain arteriography were found normal. CSF analysis showed mild protein elevation. During hospitalisation the patient presented left hemiplegia and internuclear ophthalmoplegia. Brain MRI control showed multiple de novo ischemic lesions. Cerebral arteriography was normal. Brain biopsy showed perivascular lymphocytic infiltration. The patient was treated with corticosteroids and cyclophosphamide unsuccessfully. Primary CNS vasculitis should be considered in the differential diagnosis of multiple strokes when usual work up is negative.

**When herpetic esophagitis conceals a medullary stroke in a patient with isolated dysphagia**

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Background: Isolated dysphagia is usually due to local causes and rarely due to stroke

Method: Case report of a patient with isolated dysphagia initially attributed to herpetic esophagitis in whom a medullary infarct was documented on MRI.

Results: A 70 year-old man, known for hypertension, dyslipidemia and treated for temporal arteritis diagnosed with biopsy in May 2011, presented in September 2011 with odynophagia and hypophonia due to a fungal otitis and candidal esophagitis. Antifungal therapy was initiated. A few days later, he acutely developed severe dysphagia, hiccups and fatigue without nausea or vertigo. Gastroscopy revealed herpetic esophagitis. Chest CT showed no esophageal compression but uncovered multiple pulmonary emboli. With antiviral treatment, the herpetic lesions resolved but there was no clinical improvement and parenteral nutrition was required. The neurological
exam was normal except for hiccups, cough and dysphagia to liquids and solids. Brain MRI revealed a subacute medullary stroke involving the right nucleus ambiguus. CT angiography showed agenesis of left internal carotid artery but normal arteries elsewhere, including the vertebrobasilar system. A percutaneous enteral gastrostomy tube was installed. At 3 months, the patient had begun to eat again by mouth. The presumed cause of stroke is a paradoxical embolus given the concomitant pulmonary emboli and investigations are forthcoming to confirm this.

Conclusion: Isolated dysphagia can be due to stroke, even in the presence of a local cause of dysphagia. Clues suggesting this etiology are an acute onset of symptoms, associated hiccups and the absence of improvement with treatment of local causes.

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Leptomeningeal collateral arteries (LCA) on transcranial doppler ultrasound (TCD): depths of 20-40mm redefined.
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Background: Leptomeningeal collateral arteries (LCA) have emerged as important independent predictor of prognosis in acute ischemic stroke (AIS). They can be described and graded suboptimally on CT angiography (CTA) and MR angiography (MRA) as compared to digital subtraction angiography (DSA). Further more serial of assessment of LCA is difficult with these modalities. There are few studies describing LCA on TCD.

Methods: Patients who on DSA or CTA or MRA (done in <12 hours of symptom onset) had middle cerebral artery (MCA) or T-occlusion involving terminal internal carotid artery (TICA) or tandem ICA-MCA occlusion (partial or complete) with good transtemporal window were included in the study. The TCD was performed within +/-3 hours of angiography. The anterior, posterior and middle transtemporal insonation was done focussing on the depths of 20-40mm for consistent waveforms and PMD signals. The LCA were defined as consistent PMD signals in the range of 25-35mm depths with mean peak flow velocity of >30% to the ipsilateral distal MCA (between the depths 40-50mm) with low pulsatility index (<1.2). The LCA were classified as anterior, posterior and central depending upon the angulation of the ultrasound probe.

Results: Sixteen patients were included in the study. The mean age was 58.6 +/- 14.1 years with male to female ratio of 5:3. Thirteen (81.3%) had proximal or distal MCA occlusion, 1 T-occlusion and 1 tandem occlusion. All had complete circle of Willis on TCD and angiography. LCA were seen in 9(56.3%) vs 11(68.8%) (p=0.4) patients on TCD and angiography respectively. The 2 patients in which LCA were seen on angiography but on absent on TCD had early neurological deterioration and no improvement respectively.

Conclusion: LCA can be defined and classified accurately on non-invasive tool, the TCD. Serial TCD flow parameters may be
than 24 hours. Documented past history of coronary artery disease (CAD), peripheral arterial disease (PAD) or ischemic cerebral-vascular disease (CVD) was registered. Asymptomatic CAD was analyzed using a 64-section computed tomography coronary angiography. Affected territory was considered if \( \geq 50\% \) stenosis was detected. Asymptomatic PAD was diagnosed if ankle-brachial index was \( \leq 0.9 \). Asymptomatic CVD was diagnosed in MI patients if \( \geq 50\% \) stenosis was found in the supraaortic ultrasound study.

RESULTS: 45 stroke have been included, mean age 64.5 (9.5), 88 % men, initial NIHSS (median, q25-75:2,1-4). Only four patients (9.3%) had 2 symptomatic affected territories (2 CAD, 2 PAD). After the vascular study 76.9% of patients had 2 affected territories, and 7.7%, 3 territories. Prevalence of asymptomatic CAD was 68%. Prevalence of asymptomatic PAD was 23%. In MI patients (n=100) 3% had 2 symptomatic territories (2 PAD, 1 CVD). Asymptomatic PAD prevalence was 27.7%. Only 1/75 (1.3%) had asymptomatic CVD.

CONCLUSIONS: In patients with minor atherothrombotic strokes, non-invasive studies for CAD detect a very high prevalence of asymptomatic disease. However screening of CVD in MI patients is less worthwhile.

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HIGH PREVALENCE OF SILENT ISCHEMIC HEART DISEASE IN PATIENTS WITH AHEROTROMBOTIC STROKE USING 64-ROW MULTIDETECTOR COMPUTED TOMOGRAPHY CORONARY ANGIOGRAPHY. PROCELL STUDY

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BACKGROUND: Vascular disease in other territories increases risk of vascular events in patients with stroke/TIA. PROCELL is a prospective multicenter study designed to analyze changes over time of several biomarkers of endothelial function in patients with first myocardial infarction (MI) or atherothrombotic stroke-TIA. In a substudy, we aimed to evaluate the prevalence of asymptomatic cardiovascular disease.

METHODS: Inclusion criteria were: age 45-75, previous mRS < 3, stroke-MI of less than 24 hours. Documented past history of coronary artery disease (CAD), peripheral arterial disease (PAD) or ischemic cerebrovascular disease (CVD) was registered. Asymptomatic CAD was analyzed using a 64-section computed tomography coronary angiography. Affected territory was considered if \( \geq 50\% \) stenosis was detected. Asymptomatic PAD was diagnosed if ankle-brachial index was \( \leq 0.9 \). Asymptomatic CVD was diagnosed in MI patients if \( \geq 50\% \) stenosis was found in the supraaortic ultrasound study.

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CONCLUSIONS: In patients with minor atherothrombotic strokes, non-invasive studies for CAD detect a very high prevalence of asymptomatic disease. However screening of CVD in MI patients is less worthwhile.

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Fusion of computed tomography angiography and transcranial ultrasound in the evaluation of intracranial vessels - First Experiences with a Novel Technique.
Probe by an experienced observer. Fusion of the CTA and the ultrasound was performed in the Volume Navigation system on the ultrasound scanner, which ensures complete image alignment by the identification of mutual intracranial fix points as vessel bifurcations, anatomical structures or calcifications. A radiological observer described the CTA including measuring vessel diameter and degree of stenosis of cerebral vessels. The same measurements were performed on TDC as well as Doppler-measurements.

Results:
Fusions were successful, and investigated vessels were identified easily based on CTA guidance. Vessel diameter was measured, and the CTA/TCD diameter relation was calculated. The flow direction was determined in examined vessels, and flow profile was established in case of CTA suspected stenosis.

Conclusion:
These first experiences show promising results of fusion of CTA and TCD. This technique could prove to be a useful tool in flow-assessment of intracranial vessel pathologies observed on CTA also in the acute setting.

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Introduction:
CT-angiography is used when diagnosing vascular pathology. Transcranial ultrasound has a substantial potential in determining flow profile and serial measurements for monitoring purposes. Fusion of images from these two modalities may significantly improve diagnostic quality by more precise location of vessel pathologies. We investigate the feasibility of fusion of CTA and Transcranial Color Coated Doppler (TCD) to evaluate intracranial vessels in cerebrovascular disease.

Methods:
Patients with non-acute vascular symptoms and evaluation with CTA were examined. CTA scanning protocol consists of a non-contrast CT cerebrum and a CTA from aortic arch to vertex using a 64-section MDCT with non-contrast CT cerebrum and CTA with 0.625 mm isotropic voxel resolution. TCD was performed on General Electric LOGIQ E9 with a 1,5-4,5MHz probe by an experienced observer.
HIGH-RESOLUTION MRI STUDY IN PATIENTS WITH BASILAR ARTERY DOLICHOECTASIA

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Background
Basilar artery dolichoectasia is an intracranial dilative arteriopathy, of unknown pathophysiology, associating both arterial elongation and dilatation. It can responsible for brain infarction, compression of brain stem or fatal subarachnoid hemorrhage in case of arterial rupture. Little is known about high-resolution MRI (HR-MRI) patterns in this disease.

Method
10 patients presenting basilar artery dolichoectasia (BAD) between February 2001 and March 2005 were included in this study. Usual MRI and MRA findings, were compared to HR-MRI findings, performed to explore basilar artery wall.

Results
Among 10 patients, 6 initially presented cerebrovascular events, 3 compressive symptoms and 1 had an incidental diagnosis. The median diameter of the BA at midpons level was 5.73 mm (range = 13.25 – 3.87). The median diameter at the bifurcation of the BA was 4.71 mm (range = 3.64 – 6.61) and the median BA length was 47.54mm (range = 39.18 – 70.99). On HR-MRI, in 8 cases of 10, BA wall presented a contrast enhancement. 3 patients of 10 presented a thrombus of the BA wall not seen on standard MRI sequences. The median thickness of the BA wall was 2.91mm (Range = 1 – 6.5) and was not related with clinical presentation.

Conclusion
HR-MRI provides more precise information’s on BAD wall and on thrombi formation than usual MRI with MRA sequences. Further longitudinal studies will focus on the clinical significance of the HR-MRI findings not seen on usual MRI.

Validation of Bag Re-Breathing Method Against Voluntary Breath Holding for Assessment of Cerebral Vasodilatory Reserve

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Background: Patients with severe stenoses of major intracranial arteries may develop hypoperfusion due to failed cerebral vasodilatory reserve (CVR). Assessment of CVR with transcranial Doppler (TCD) using Breath-Holding Index (BHI) is an established method. But, many patients may not hold breath sufficiently for reliable assessment. We tested rebreathing in a standard bag for assessing CVR in middle cerebral arteries (MCA). Methods: Using Spencer’s head frame, simultaneous monitoring of mean flow velocities (MFV) of both MCAs were recorded during breath-holding in patients with severe intracranial ICA or MCA stenoses to calculate BHI. They were then asked to re-breathe in a
standard HDPE/W/ADH 8X12 bag for 1 minute. End-tidal carbon dioxide levels were monitored to ensure adequate hypercapnea and relative changes in the MFVs were noted. Receiver-operating characteristic curve was used to determine the best cut-off value of relative change in MFV to predict BHI of ≤0.4. Tests were performed twice in each patient, separated by 5 minutes. Patients with exhausted CVR were further evaluated with acetazolamide-challenged HMPAO-SPECT. We have previously established that BHI value of ≤0.4 is predictive of vasodilatory failure on SPECT. Results: Of a total of 58 patients, 39 (67%) were male, 43 (74% Chinese) and mean age 46 years (range 25-62). All tolerated the tests without any untoward effects. Intracranial stenoses were 42 (72%) in one MCA, 11 (19%) in both MCAs and 7 (10%) in the intracranial ICA. Intracranial steal phenomenon was seen in 10 (17%) cases. Median BHI (interquartile range, IQR) in affected MCA was 0.13 (0.34) vs. 1.1 (0.43) in the control. Median (IQR) relative change in MFV in affected MCA during bag rebreathing was 19% (17). Relative change of 15% in MFV of affected MCA was the best predictor of BHI value of ≤0.4 (sensitivity 97.5%, specificity 96.2%, area under the curve 0.971, 95% confidence intervals 0.919-1.0; p<0.005). Conclusions: Standardized bag rebreathing test is reliable for the assessment of CVR in patients with severe stenoses of intracranial ICA and MCA.
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Background: Hemorrhagic conversion from ischemic stroke is an important prognostic factor of outcome and can precipitate clinical deterioration in stroke patients treated with fibrinolysis. Transcranial Doppler Ultrasound (TCD) is a routine test used to assess intracranial circulation status. Increased values of pulsatility index (PI) measured with TCD have been associated with increased intracranial pressure. Hemorrhagic conversion increases compartmentalized mass effect. We hypothesized that increased PI values can predict hemorrhagic conversion in stroke patients.

Methods: Retrospective analysis of all patients treated with intravenous fibrinolysis during 2011 for ischemic stroke in anterior circulation. Exclusion criteria included: (1) occlusion or high-grade stenosis of the middle cerebral artery (MCA) and (2) inadequate TCD windows. Hemorrhage was identified according to NINDS criteria and only PH1, PH2, PHr1 and PHr2 were considered. PI’s were measured ipsilateral and contralateral to stroke location in the middle cerebral arteries. Normal values of $1.0 \pm 0.2$ were assumed. Differences in proportions were assessed using the Chi-square and Fisher’s exact tests and Odds Ratio were calculated.

Results: 95 patients fulfilled defined criteria. 11 patients had hemorrhagic conversion. Of this, 11 showed elevations in PI values homolaterally and 10 showed ele-
Background and Objective: Intracranial atherosclerosis is associated with recurrent ischemic stroke. High resolution MR imaging can provide information about atheroma in vivo including plaque volume, composition, and activity. We performed high resolution MR imaging in stroke patients with middle cerebral artery (MCA) stenosis to evaluate atherosclerosis activity and to determine its relationship with infarction patterns.

Methods: Between July 2009 and August 2011, the patients with MCA territory infarction or transient ischemic attack were enrolled and 3-T high resolution MR imaging was performed in the relevant MCA. We analyzed the status of the intracranial atheroma and infarction pattern in the corresponding vascular territory. Intracranial atheroma was defined as a vulnerable symptomatic (VS) plaque when it accompanied by intra-plaque heterogeneous signal intensity and plaque enhancement and as a stable symptomatic (SS) plaque otherwise. Cerebral infarction pattern was defined as artery-to-artery embolic infarction when multiple lesions were present within the MCA territory.

Results: High resolution MR images were acquired from 35 patients, which revealed the presence of a SS plaque in 14 patients and the presence of a VS plaque in 12 patients. Nine out of 12 patients with a VS plaque presented with arterial embolic infarction, whereas three out of 14 patients with a SS plaque experienced arterial em-
Differentiation of a severe stenosis or even a pseudo-occlusion of a middle cerebral artery (MCA) from a completely blocked arterial segment is difficult with non-invasive diagnostics. Time-of-flight (TOF) MR angiography (MRA) at 7 Tesla has demonstrated superior visualization of small intracranial arteries compared to MRA at lower field strength. We additionally investigated patients (pts) with severe stenosis or supposed pseudo-occlusion at routine clinical diagnostics with TOF-MRA at 7 Tesla.

Methods:
After informed consent, 19 asymptomatic or minor symptomatic pts were included. All pts had undergone clinical work-up including TOF-MRA and/or contrast enhanced MRA at 1.5 Tesla and color-coded transcranial duplex sonography. Observers of 7 Tesla TOF-MRA were blinded for clinical findings and other vascular findings.

Results:
Pts’ mean age was 46.7 years (SD 10.4), 8 pts were men, 11 women. At duplex sonography, 5 pts demonstrated a severe MCA stenosis with increased peak systolic velocity (PSV) and severely decreased poststenotic flow velocity, 14 pts a severely decreased poststenotic flow velocity without detection of an intrastenotic PSV. TOF-MRA at 1.5 Tesla showed a flow void in the 5 pts with stenosis and a complete signal loss of the MCA in the latter 14 pts. Contrast enhanced MRA demonstrated a severe stenosis in one patient and a segmental signal loss in the other pts. At TOF-MRA at 7 Tesla, 4 of the 5 pts with duplex stenosis and one of the 14 pts without stenotic PSV exhibited severe stenosis, whereas 14 pts showed a segmental signal loss with len-
Background
Blood supply through collateral pathways improves regional cerebral blood flow and may protect against ischemic events. We assessed the importance of the collateral intracranial flow on clinical presentation (stroke or TIA) and infarct type, in patients with severe internal carotid artery stenosis (sICAs).

Methods
We evaluated 20 patients (mean age 76 years, 88% men) with unilateral stenosis (>70%) or occlusion of the ICA and contra-lateral ICAs between 0% and 69%. Carotid stenosis degree, collateral and Willis architecture were evaluated by angioMRI or angioCT. The circle of Willis (cW) pattern was categorized as: complete or incomplete (absence due to hypoplasia or occlusion of anterior and posterior communicating arteries). Collateral leptomeningeal flow was categorized as: poor (<50% of contralateral number and caliber of vessels) (PC) or good (>50%) (GC). We evaluated the ASPECTS score, infarct size and classified the type of stroke as follows: small distal, cortical and subcortical watershed and major stroke.

Results
We analyzed 3 groups of patients; G1: complete cW and GC (40%), G2: complete cW and PC (40%), G3: incomplete cW and PC (20%). Symptomatic patients were 50% of G1 and 75% of G2-3. Mean ASPECTS score was 9 in G1, 9.5 in G2 and 7.3 in G3. Infarct size (in mm) was 18.7 in G1, 13.5 in G2 and 43 in G3. Infarct type was 60%...
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**Multilevel assessment of atherosclerotic status using 64-slice Multi-Detector CT in acute stroke patients: COCASE 2 study**

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Background: COCASE (COeur, CArotides, Scanner multibarrettes, Etiologie des infarctus cérébraux) was a single center, prospective, open pilot study that was first designed to assess the potential of a single session Multi-Detector CT (MDCT) protocol in the etiological workup of transient ischemic attack (TIA) or acute ischemic stroke as compared to established imaging methods. To date no study has evaluated the global atherosclerotic status from heart to brain using a one single protocol MDCT in stroke patients. Methods: From August 2007 to August 2011, 96 patients with non-cardioembolic ischemic stroke or TIA were enrolled. All patients had a MDCT and a detailed arterial workup according to the 4 levels: intracranial, cervical, aortic arch and coronary arteries. Only ≥ 50% cervical, intracranial or coronary stenosis and ≥ 4mm aortic arch plaque were taken into account. A score, ranging from 0 to 4, was attributed according to the number of levels affected. Preliminary results: Ninety-one patients had an interpretable MDCT. Mean age was 67.4 years (+/-11.0). Fifty-three (58.9%) were diagnosed with TIA. The prevalence of score 0, 1, 2 and 3 were respectively 48.3% (n=44), 35.2% (n=32), 12.1% (n=11) and 4.4% (n=4). Patients with a score ≥ 2 tend to be older than patients with a score <
2 [odds ratio (OR) = 1.97; 95% confidence interval (CI) =0.95–4.09]. Adjustment for mainly confounding factors did not alter the results. Exhaustive data will be presented during oral session. Conclusion: MDCT is a promising tool to assess atherosclerotic status in stroke patients. It may allow an optimal selection of high risk patients who could benefit from more aggressive prevention strategy.

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Association between disturbed glucose metabolism and cervical atherosclerosis in patients with TIA or ischemic stroke.
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Background
In patients with ischemic stroke or TIA, prediabetes is associated with an increased risk of recurrent ischemic stroke. However, the underlying pathogenic mechanisms are not clear. We aimed to assess the association between impaired glucose metabolism and cervical atherosclerosis.

Methods
We prospectively studied non-diabetic patients with recent TIA or ischemic stroke. Patients were divided into 3 groups based on the oral glucose tolerance test: normal glucose metabolism (NGM, fasting glucose level <5.6mmol/L and 2-hour post load glucose level <7.8mmol/L), prediabetes (fasting glucose levels 5.6-6.9mmol/L and/or 2-hour post load glucose levels 7.8-11.0mmol/L) and newly diagnosed diabetes (DM, fasting glucose level >=7.0mmol/L and/or 2-hour post load glucose level >=11.1mmol/L). In all patients, CT-angiography was performed and scored for degree of stenosis and the presence of calcifications in the carotid and vertebral arteries and aortic arch. The relations between the glucose subgroups and the presence of stenosis >= 50% or calcifications were expressed as odds ratios. Adjustments were made for age, sex, hypertension, hypercholesterolemia, and smoking with a multivariable logistic regression model.

Results
Of 765 patients included, 260 (34%) had NGM, 320 (42%) had prediabetes and 185 (24%) had DM. Compared with patients with NGM, those with DM had a significantly higher risk of stenosis >=50% (aOR 1.89, 95% CI 1.17-3.04) and calcifications in the carotid arteries (aOR 1.84, 95% CI 1.08-3.13). Prediabetes tended to be associated with stenosis >=50% as well (aOR 1.42, 95% CI 0.94-2.15). Two-hour post-load glucose levels were associated with stenosis >=50% and calcifications in the carotid arteries and aortic arch (aOR (95% CI) resp 1.08 (1.03-1.13), 1.08 (1.02-1.14) and 1.07 (1.00-1.14)).

Conclusion
Newly diagnosed diabetes and 2-hour post-load glucose levels are associated with cervical atherosclerosis in patients with TIA or ischemic stroke.
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**Gradient Flow Diversion on TCD and low ASPECTS score on admission is a marker of collateral circulation failure in acute ischemic stroke.**

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Background: In acute ischemic stroke with middle cerebral artery (MCA) occlusion there is diversion of the blood flow to other arteries of same or other hemispheres. It is considered as surrogate marker of collateral circulation recruitment and is associated with good prognosis in the early phase. Little is known about the dynamics of the flow diversion and its implication in patients with poor prognosis.

Methods: In this prospective study, patients who were treated with intravenous thrombolysis and transcranial doppler (TCD) monitoring were screened. Patients with partial or complete occlusion of the MCA on the TCD were included in the study. Gradient Flow Diversion (GFD) was defined as increased velocity (>10%) of ipsilateral anterior cerebral artery (iACA) and/or ipsilateral posterior cerebral artery (iPCA) as compared to contralateral MCA. Also if the absolute mean flow velocity (MFV) was >80 cm/sec for the contralateral MCA, >70 cm/sec for the iACA, and >60 cm/sec for the iPCA was considered to have GFD. Results: Of the 80 patients screened 58 had partial or complete MCA occlusion. Twenty five (43.1%) patients had GFD and mean age was 65 +/- 15.6 years. Median NIHSS at baseline was 10 and 13 dropping to 6 and 7 at 24 hours in patients with GFD and without GFD respectively. A poor ASPECT score (<7) was noted in 28% and 19%, with median ASPECT score of 8 and 9 in patients with GFD and without GFD respectively. Partial or complete recanalisation was achieved in 63.3% and 72.4% in patients with GFD and without GFD respectively. The baseline median TIBI score was 1.5 and 2 in patients with poor ASPECT score and presence or absence of GFD respectively. Average increase in the MFV in the GFD artery was 47.7% in patients with ASPECT score >=7 vs 27% with ASPECT score <7.

Conclusion: GFD is associated with MCA occlusion. It’s presence is not universally associated with good outcome. A ASPECT score of <7 with GFD may suggest a collateral circulation failure.

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**Association between arterial calcifications and stroke subtypes**

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Background

Current classification models for ischemic stroke are based on clinical symptoms, cardiac and hemostatic screening and imaging tests like degree of carotid artery stenosis. We investigated if arterial calcifications add
Presence and volume of aortic arch calcifications are associated with LVD and can help in the differentiation of LVD from other stroke subtypes. The additional role of calcifications in the carotid arteries is questionable.

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ANTERIOR ISCHEMIC OPTIC NEUROPATHIES: CLINICAL AND ULTRASONOGRAPHIC CHARACTERISTICS IN ARTERITIC VERSUS NONARTERITIC FORMS

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Background: To describe characteristic clinical features and ultrasound findings (Color Doppler Imaging – CDI of orbital vessels and Color duplex sonography of the superficial temporal and the carotid arteries) which help to differentiate newly diagnosed Arteritic (A-) from Non-Arteritic (NA-) Anterior Ischemic Optic Neuropathies (AION).
Methods: In this prospective study, 37 consecutive patients first seen in our departments of ophthalmology and neurology from October 2005 to October 2011 with clinical suspicion of unilateral AION were examined following a complex protocol including CDI of orbital vessels. We used an ultrasound (US) equipment (Logic 500, GE) with 8-15MHz linear probe for detecting and measuring the blood flow in the orbital vessels.

Results: The final diagnoses were A-AION due to GCA in 5 patients, all of them with biopsy-confirmed disease, and 32 patients with NA-AION. A combination of a history of amaurosis fugax before an abrupt, painless, and severe loss of vision of the involved eye, with retinal infarct in the region of the occluded cilioretinal artery and a diffuse pale optic disc edema was extremely suggestive of A-AION. However, none of these symptoms was ever found in NA-AION. The Spectral Doppler Analysis of the orbital vessels in A-AION revealed low blood velocities, especially end-diastolic velocities, and high RI in all retrobulbar vessels, in both orbits (with severe diminished blood flow velocities in the PCA, especially on the affected side). In NA-AION blood velocities and RI in PCA were relatively preserved.

Conclusion: CDI of retrobulbar vessels data supported the evidence of involvement of the entire trunk of the PCA in the A-AION. In contrast, in the NA-AION, the impaired flow to the optic nerve head was distal to the PCA themselves, possibly at the level of the paraoptic branches (only 1/3 of the flow of the PCA).

Background: Peripheral artery disease (PAD) is common in patients with acute cerebral ischemia (AIS). Since transcranial Doppler (TCD) is routinely used in stroke patients to detect intracranial atheromatous disease, we sought to explore whether pulsatility index (PI) can predict the presence of PAD in these patients.

Methods: Consecutive patients with AIS...
were prospectively evaluated. On TCD, peak systolic, end-diastolic and mean flow (MFV) velocities in both middle cerebral (MCA) and basilar arteries were manually measured. The PI was automatically calculated using a complete four-cardiac cycle sweep without arrhythmias. Bilateral brachial, tibial and pedal systolic blood pressures (SBP) were measured using a continuous-wave, 4-MHz Doppler (average of two measurements). The ABI was calculated by dividing the highest lower-extremity SBP by the highest brachial SBP. ABI 0.91 to 0.99 was considered as borderline, ABI ≤0.9 as abnormal and predictive of PAD. In patients with non-compressible tibial arteries (ABI >1.3), toe-brachial-index (TBI) was calculated (abnormal <0.7). All examinations were done in supine position.

Results: We enrolled a total of 34 patients (59% Caucasians; 47% men; mean age 63±0.5 yrs; median NIHSS 1.5, range 0-20). ABI was borderline or abnormal in 16/34 (47%) including 6/34 (18%) patients with ABIs consistent with PAD. Baseline characteristics were similar between patients with and without PAD except for hematocrit, which showed a trend towards significance (median 40 vs. 43, p=0.06). The maximum PI was not an independent significant predictor of PAD (OR=1.8, 95%CI 0.04-86.7, p=0.77). Tobacco use was considered a confounder as it was significantly correlated with both maximum PI and ABI. After adjusting for tobacco use, linear regression found maximum PI to predict ABI, although this did not reach statistical significance (p=0.08).

Conclusion: Our exploratory study did not find PI to be a significant independent predictor of PAD. However, post-hoc sample size calculations suggest that we need 126 patients to detect a significant association between TCD variables and PAD, hence we are launching a multi-center, multi-ethnic study.

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Collateral circulation on Computed Tomography Perfusion Source Images predicts the response to stroke intravenous thrombolysis

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Background and objectives: Computed Tomography Perfusion Source Images (CTP-SI) may allow dynamic assessment of leptomeningeal collateral (LMC) filling and emptying in MCA ischemic stroke. We described a regional LMC scale on CTP-SI and hypothesized that a higher collateral score would predict a better response to intravenous thrombolysis in a way more comparable to DSA than the static Computed Tomography Angiogram Source Images (CTA-SI).

Subjects and Methods: We studied consecutive ischemic stroke patients with an acute middle cerebral artery (MCA) occlusion treated with i.v. thrombolysis who underwent CTP prior to treatment. Readers evaluated CTP-SI in a blinded fashion to assess LMC within the hypoperfused
MCA territory. LMC were within the ischemic MCA territory delimited by mean transit time (MTT) map scored as follows: 0, absence of vessels; 1, collateral supply filling $\leq 50\%$; 2, $>50\%$ but $< 100\%$; 3, equal or more prominent when compared to the unaffected hemisphere. The scale was collapsed into good (scores 2-3) vs. poor (scores 0-1) collaterals. Primary outcome variable was good three-month outcome. Secondary outcome variables were early neurological recovery, transcranial Duplex-assessed 24-hours MCA recanalization, and infarct volume.

Results: 54 patients were included (55.5% women, median NIHSS 10), and 4-13-23-14 patients had LMCs of 0-1-2-3 respectively. The probability of good long-term outcome augmented gradually with increasing LMCs: (0) 0%; (1) 15.38%; (2) 65.21%; (3) 64.28%, $p=0.004$. Good-LMCs was independently associated with good outcome (OR 21.02 [95% CI 2.23-197.75], $p=0.008$). Patients with good-LMCs had better early neurological recovery ($p=0.001$), smaller infarct volumes ($p<0.001$) and a clear trend towards higher recanalization rates.

Conclusion: A higher degree of leptomeningeal collateral arterial circulation assessed by CTP-SI predicted a better response to intravenous thrombolysis in MCA ischemic stroke patients.
to early recognition of patients with large vessel occlusions and fast track referral to interventional procedures.

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Ultrasound characteristics of dementia in renal patients
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Background: It has been suggested that vascular ultrasound findings are associated with dementia. The aim of this study was to determine the association of carotid, femoral, middle cerebral artery (MCA) ultrasound findings with dementia.

Methods: Analysis involved imaging by duplex of carotid and femoral arteries of 61 patients (43 male, 18 female, mean age: 63.14 years) in a longitudinal fashion, to detect the presence of plaque and to assess the intima media thickness (IMT). Each artery was assigned a score (presence of plaque = 1, absence of plaque = 0, IMT ≥ 0.8 mm = 1, IMT < 0.8 mm = 0) and the total score of the four vessels (two carotid and two femoral) was calculated per patient (atherosclerotic ultrasonic score - ATHUS). Subsequently the mean pulsatility index (PI) of both MCAs and the minimental state examination (MMSE) of every patient was evaluated. Brain CT scans were performed to ensure the small vessel disease as the cause for the intellectual decline of patients. Results: Group A (ATHUS = 0-2, 26 patients) was associated with median MMSE of 29 and interquartile range of 2. The corresponding values for Group B (ATHUS = 3-5, 16 patients) and
Group C (ATHUS=6-8, 19 patients) were: 28(3.75) and 25(5) respectively (p<0.01). PI of 0.97 separated the patients in terms of MMSE into: Group D (PI<0.97, median MMSE=29, interquartile range=2) and Group E (PI>0.97) with corresponding values of 28(4) (p<0.01).

Conclusion: Our results suggested that the degree of atherosclerosis was inversely related to MMSE. This position might be clarified in larger studies of intellectually declined patients, aiming to establish the role of atherosclerosis detected on ultrasound in dementia.

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NIHSS Scores and Arteriographic Findings in CT and MRI in Acute Ischemic Stroke

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BACKGROUND: To test the hypothesis that the National Institutes of Health Stroke Scale (NIHSS) score is associated with the findings of CT-angiography (CTA) and MR-angiography (MRA), performed within the first six hours after ischemic stroke.

METHODS: We analyzed NIHSS scores on hospital admission and clinical and imaging findings of 1670 consecutive patients (612 women, 1058 men; mean age 66 +/- 14 years), who underwent imaging (CTA n=426, MRA n=1244) within the first six hours after ischemic stroke.

RESULTS: From stroke onset to clinical examination, 146+/-80 minutes elapsed, and from stroke onset to CTA/MRA 175+/-80 minutes. Median NIHSS was 7 (range 0 to 40), and scores differed depending on the imaging findings. NIHSS scores in basilar, internal carotid, and middle cerebral artery...
M1 and M2 segment occlusions (central occlusions) were higher than in more peripherally located or nonvisible occlusions. Patients with NIHSS scores ≥8 had a positive predictive value (PPV) to show arterial occlusion in 87% of carotid and with NIHSS scores ≥5 in 64% of vertebrobasilar strokes. With a NIHSS score of ≥8, PPV to find a central occlusion was 81% in CTA/MRA. CONCLUSIONS: There is a significant association of NIHSS scores and the presence and location of a vessel occlusion in carotid, but not in vertebrobasilar strokes. With a NIHSS score ≥8, a central vessel occlusion will likely be seen in 4 of 5 patients.

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4D-Volume Perfusion CT for the detection of cerebral vasospasm: Analysis of colour coded parameter maps and 4D-CT Angiography

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Background: Cerebral vasospasm after subarachnoid hemorrhage (SAH) implies high risk for secondary ischemia. Early diagnosis of cerebral hypoperfusion is important to start treatment on time (intensive care and/or neurointerventional). We tested the utility of 4D “whole brain” volume Perfusion CT (4D-VPCT) for detecting both localization and characteristics of arterial vasospasm and the volume at risk of secondary infarction.

Methods: Patients with suspected cerebral vasospasm after acute subarachnoid hemorrhage (SAH) received non-contrast CT of the brain to exclude acute hydrocephalus. Afterwards 4D-VPCT was performed. CT angiographic axial and coronal maximum-intensity projections of the head were reconstructed from the peak arterial scan of the 4D-VPCT dataset to determine arterial vasospasm or occlusion and were compared to conventional CTA or DSA. The distribution of ischemic lesions was analyzed on 3D perfusion parameter maps of cerebral blood flow (CBF), cerebral blood volume (CBV), mean transit time (MTT) and time to drain (TTD).

Results: A total of 20 patients were included in this study. In 80% (n=18) focal cerebral hypoperfusion was detected on parameter maps of VPCT. Highest sensitivity was found for MTT and TTD. In 16 patients (89%) focal vasospastic lesions of intracranial artery segments could be detected both on thin MIP reconstructions of 4D-VPCT as well as on conventional CTA or DSA, resulting in 100% sensitivity. In 3 patients balloon angioplasty of the vasospastic segments was performed subsequently, leading to normalization of focal perfusion and vessel diameter on follow up VPCT.
Conclusion: 4D-VPCT is a non-invasive method to identify cerebral vasospasms in patients suffering from acute SAH. It has the ability to detect both focal perfusion deficits as well as vasospastic arterial segments. With DSA still being the gold standard for detection of cerebral vasospasms, VPCT has the potential to improve non-invasive diagnosis and treatment decisions.

Clinical and Blood Biomarkers for Collateral Flow Extent in Ischemic Stroke
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Introduction
Collateral flow (CF) via leptomeningeal anastomoses is associated with favourable clinical and radiological outcomes after stroke. Patients with good CF may benefit from recanalisation in later time windows, while measures to improve CF are the subject of novel therapies, but little is known about factors controlling collateral recruitment.

Methods
CF was evaluated on patients with arterial occlusions imaged <6 hrs from stroke onset using CT angiography. Vascular pixels measured in the symptomatic and contralateral arterial territory were quantified according to Hounsfield unit and a ratio of affected to normal hemisphere was determined. Patients with good (>75% territory filling via collaterals) and reduced (<75%) collaterals were compared for clinical predictors of CF. Impact of CF on clinical and imaging outcomes was evaluated.

Results
42 Subjects with Internal Carotid (n=13) and Middle Cerebral Artery occlusions (n=29) were evaluated. Admission NIHSS was significantly lower in good versus reduced CF groups (median 13, IQR 9-17 and 19, IQR 14-23 respectively). Atrial Fibrillation and higher blood fibrinogen were significantly associated with reduced CF. Previous medication, blood pressure, carotid stenosis and blood glucose were not associated with CF adequacy. Good CF was significantly associated with smaller final infarct volume [Median 21.6 ml (IQR 0-151) and 60.9ml (IQR1.1-364.0) p=0.006] but impact on clinical outcome at day 30 was not statistically significant.

Conclusion
Better flow via leptomeningeal collaterals within 6h of onset was associated with significantly lower infarct volume and was less common among patients with atrial fibrillation. Elevated fibrinogen level was a potential biomarker for poor collaterals.

EFFECTIVENESS OF TCCS IN DIAGNOSIS OF MIDDLE CEREBRAL ARTERY SPASM RESULTING SAH-COMPAARED TO DSA AS REFERENCE STANDARD
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Purpose/Vasospasm of the cerebral vessel remains a major source for morbidity and mortality after aneurysmal subarachnoid hemorrhage (SAH). The aim of our study was to determine the accuracy of transcranial color-coded duplex ultrasonography (TCCS) for diagnosis of middle cerebral artery spasm, with digital subtraction angiography (DSA) used as the reference standard.

Methods/The study included 69 patients (age 55+/−10 years) who had aneurysm clipping surgery for SAH due to a ruptured aneurysm, admitted to the St Sava Hospital from January 1 to December 31, 2010. At least one DSA was performed between day 3 and 14 after SAH, and at the same time total number of TCCS measurement was 207 (3 for each patient). MCA/ICA index and blood flow velocity (BFV) of the M1 and M2 branches were measured with TCCS and compared with DSA findings.

Results/PSV and MFV for both M1 and M2 were significantly higher in patients with spasm than in those without spasm (p>0.01), and MCA/ICA index was >3. The ROC curve identified the best cutoff point for M1 (PSV 250 cm/s and MFV 125 cm/s) and for M2 (PSV 160 cm/s and MFV 80 cm/s). Comparison of TCCS and DSA was possible in 58 cases. DSA showed vasospasm in 46 cases, confirmed by TCCS in 31 cases (67%).

Conclusion/Our results confirm the good diagnostic accuracy of TCCS for the detection of aneurysmal-related vasospasm. TCCS monitors the hemodynamic state of the anterior part of the circle of Willis, which could expose the patient to a delayed ischemic deficit.
Background:
The prevalence of intracranial stenosis (ICS) in Chinese is thought to be higher than Caucasians. However, there is limited data available from population-based studies. We, therefore, examined the prevalence of and risk factors for ICS among community-dwelling Chinese from Singapore.

Methods:
This study is part of the on-going community-based Singapore Chinese Eye Study. Selected subjects were invited to undergo clinical assessments and brain magnetic resonance imaging (MRI) with 3-dimensional time-of-flight MR angiography (MRA). ICS was defined as > 50% luminal narrowing in at least 1 intracranial artery. Prevalence rates were computed per 5-year age and sex strata. Associations between baseline risk factors and ICS were assessed using logistic regression adjusted for age and gender and expressed as odds ratios (OR) with 95% confidence intervals (CI).

Results:

Conclusions
1. CDUI (with good ultrasound views) in patients with non-complicated 50-99% stenoses appears to be a safe and reliable method of assessment rather than merely a screening test. These data confirm the validity of CDUI as the sole means of assessment of carotid stenosis in our institution.
2. Patients with complex cases, occlusions or inconclusive findings on initial imaging require subsequent imaging which often affects decision to operate.
3. Subsequent imaging leads to significant delays to surgery, while not affecting the measured stenosis or decision to operate in non-complex patients.

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Prevalence of and Risk factors for intracranial stenosis in community-dwelling Singaporean Chinese
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Background:
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Vertebral artery hypoplasia (VAH) is a variation of the posterior circulation (PC). Although VAH is widely regarded as being without pathological significance, a recent study by Perren et al. (Neurology 2007) suggested that VAH is a predisposing factor for PC stroke. We aimed at verifying this hypothesis in a larger patient collective.

Methods
We prospectively collected 828 consecutive patients with an acute ischemic stroke admitted to our stroke center. All patients underwent a standardised stroke work up. VAH was defined by a diameter of ≤2.5 mm or difference to the contra-lateral side of >1:1.7 in the V2 segment of the VA by B-mode and color-coded duplex flow imaging measurement. Stroke etiology in all patients was classified using the ASCO-Score.

Results
186 out of 828 patients (22.5%) had PC strokes. In the other 642 (77.5%) patients, ischemia was located in other territories. 69 (8.3%) patients showed a VAH, 38 (55.1%) in the right and 27 (39.1%) in the left VA, only 4 (5.8%) patients had bilateral VAH. Only 5 of 69 (7.5%) patients with VAH had a stroke located in the VA territory (i.e. PICA territory, lateral medulla oblongata), 21 of 69 (30.4%) patients with VAH had a PC stroke and in the other 48 (69.6%) patients, stroke was located in other territories. There was no significant difference regarding age and stroke etiology between patients with or without VAH.

Conclusion
As recently described, we found that VAH is located mostly in the right VA. We found no significant difference in age between...
stroke patients with or without VAH. In contrast to the aforementioned publication, we found no significant association of VAH with stroke in the PC and no significant difference in stroke etiology. In addition, PC strokes in patients with VAH were not predominantly located in the VA territory. We could therefore not support the results of this previous study and showed that VAH is indeed a normal variation without pathological significance.

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Evaluation for the Visualization of Arterial Flow on TOF MR Angiography in Patients with Chronic Occlusion of Cerebral Main Artery
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(Introduction) Signal intensity loss of cerebral main artery on MR Angiography (MRA) using 3D time-of-flight (TOF) technique is in general diagnosed as its arterial occlusion. Meanwhile, in some limited cases with the occlusion of internal carotid artery (ICA) or middle cerebral artery (MCA) revealing signal intensity loss of ipsilateral MCA on TOF-MRA, angiographic examinations delineated by contrast media, such as CT angiography (CTA) or conventional angiography, show the apparent delineation of MCA. However, the reason for that phenomenon has not been verified so far. Therefore, we have evaluated the factor for delineation of MCA on TOF-MRA with cerebral blood flow and MR spectroscopy (MRS).

(Methods) Ten cases that were suspected of having an occlusion of MCA or ICA were enrolled. All cases underwent 3T MRI, CTA, and qualitative CBF examination. TOF-MRA and MRS were performed with 3T MRI (SIGNA HDxt: GE), CTA with 64-raw CT (LightSpeed VCT: GE), and CBF analysis with (Infinia3: GE). Out of all ten cases four had signal loss of MCA on TOF-MRA and the rest of six revealed anterograde or collateral MCA flow, meanwhile CTA revealed delineation of MCA in all cases. Between the 2 groups with (flow group) or without (non-flow group) MCA signal on TOF-MRA both the quantitative CBF analysis and the calculation of some parameters on MRS were conducted and compared.

(Results) Resting CBF indicated no significant difference between groups, whereas the mean value of cerebrovascular reactivity (CVR) in non-flow group was significantly lower than that in flow group (p<0.01). In the analysis of MRS Lipid&Lactate(LL)/Creatine(Cr) in non-flow group was significantly higher than that in flow group (p<0.05), furthermore, the additional analysis in all 10 cases revealed that CVR in the lesion side significantly had a negative correlation with LL/Cr (R2=0.53).

(Conclusion) This study has shown that a defect of flow signal on TOF-MRA has strong association with CVR and LL/Cr on MRS. Further study to address the mechanism in these results would be desirable.
Methods: We prospectively studied 43 patients admitted with acute ischemic stroke of unknown etiology. Simultaneous TTE with TCD were performed using agitated saline solution and Valsalva maneuver, according to a predefined protocol. TTE was considered positive when there were bubbles in the left atrium within three cardiac cycles. TCD was considered positive when one high intensity transient signal was identified. TEE was performed during admission by operators blinded to the previous results.

Results: 15 PFO were detected by TEE. There is a statistically significant superiority for TEE in the capacity of detecting shunts compared with both TTE+TCD (p=0.043) but not for each separate procedure TTE (p=NS), TCD (p=0.08). In comparison to the TEE, the sensitivity is 86.7% for TTE, 100% for TCD, and 100% for TTE+TCD; the specificity is 88.9% for TTE, 82.4% for TCD and 76.5% for TTE+TCD; the positive predictive value is 86.7% for TTE, 81.3% for TCD, 76.5% for TTE+DTC; and the negative predictive value is 88.9% for TTE, 100% for TCD, and 100% for TTE+TCD. Analyzing only the patients with shunts identified by TCD, TTE did not increased the specificity of TCD (75%) and the positive predictive value for TTE increased to 92.9% (p=0.03).

Conclusions: TCD seems to be an excellent screening procedure for detection of right-to-left shunt in acute stroke patients. TTE does not increase the specificity of TCD. TEE should be performed when TCD is positive and is unnecessary for detecting PFO when TCD is negative.
Value of Gradient-echo MRI in Evaluation of Multiple Occlusions of Cerebral Arteries in Acute Stroke

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Introduction: Embolic thrombi from the heart or large artery may contribute to occlusions at multiple sites in the cerebral arterial tree. It is however difficult to detect distal occlusions on MR or CT angiography. Gradient-recalled echo (GRE) MRI susceptibility vessel sign (SVS) reflects occlusion of a vessel by a RBC-dominant clot. We explored the usefulness of this sign in detecting occlusions in the cerebral arterial tree.

Methods: Consecutive acute ischemic stroke patients were scanned within 6 hours after symptom onset using a 3T MR imaging unit. Intracranial arterial occlusions were identified on MR angiography. Patients with occlusion of the distal internal carotid or anterior cerebral arteries were included in our analysis. SVS is defined as a “blooming artifact” on GRE corresponding to site of occluded artery on MRA.

Results: Of 147 patients (75 men, age: 66.7± 11.7), 50 patients (34.0%) had Carotid T occlusions, 95 patients (64.6%) had occlusion of M1 segment of the middle cerebral artery (M1 MCA) and 2 patients (1.4%) had occlusion of M2 segment MCA. Sinus artifact prevented visualization of the SVS in 12 patients. In 80 patients (59.3%), location of SVS corresponded to the site of thrombus on MR Angiography. Multiple SVS were seen in 8 patients (10%). These were as follows: a) distal ICA and M2 MCA n= 5 b) M2 MCA and ACA n=3. MR angiography however did not show these multiple occlusions in 7/8 (87.5%) patients.

Conclusion: In addition to providing information on the nature of a clot, GRE can be a useful tool in detecting multiple occlusions especially when distal and proximal occlusions co-exist.

Hyperdense Middle Cerebral Artery Hounsfield Units Predict Early Recanalization in Patients with Acute Ischemic Stroke


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HU densities were calculated using a polygonal region of interest including the entire thrombus in the plane of its maximum dimension. Both mean and maximum HU were recorded. Early recanalization was defined as partial or complete recanalization identified by TCD or DSA at 2 hours post tPA bolus or at the end of IA procedures.

Results: Of 530 patients (55% men; mean age 62±15 years; baseline median NIHSS score 9), 48 (9%) had HMCA: 25 (52%) received IV-tPA and 45 (94%) IA or IV-IA therapy. Complete recanalization was achieved in 9 (31%) patients, partial in 28 (58%). Mean HU of HMCA was 51±10, with a maximum HU of 71. When comparing patients who did recanalize to patients who did not, only age was significantly different (mean 57 vs. 69 yrs, p=0.046). An inverse correlation was seen between the maximum HU density and complete recanalization (r=-0.215, p=0.073). Among patients who received IA, mean HU did not differ between patients with and without complete recanalization (67±12 vs. 74±12, p=0.128). Mean HU density did not predict complete recanalization (OR=0.961, 95%CI 0.834-1.108, p=0.583). After adjusting for diabetes mellitus and previous strokes, maximum HU density was a significant independent predictor of complete recanalization after IA therapy (OR 0.877, 95%CI 0.790-0.972, p=0.013). Conclusion: Our study found that in patients with hyperdense MCA sign, maximum HU predicted complete recanalization, not mean HU.
Hyperdense arterial sign reflects the proportion of red blood cells in the thromboemboli of acute stroke patients

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Background: Hyperdense arterial sign (HAS) in the non-contrast brain CT (NCT) is the result of increased attenuation by occlusion with thromboemboli in the cerebral vessel. In this study, we wanted to reveal the association between HAS within NCT and histologic composition of the thromboemboli retrieved during acute mechanical thrombectomy. Methods: Between April 2010 to June 2011, consecutive ischemic stroke patients within 6 hours from onset who underwent the modified aspiration thrombectomy with the reperfusion catheter of the Penumbra System were selected. Clinical and laboratory data were collected from our thrombolysis registry. HAS and Hounsfield unit (HU) of the occlusion area were evaluated with raw NCT images (thickness 0.8mm). For histologic analysis, the digital slide images of retrieved thromboemboli stained with haematoxylin and eosin were used. Area fraction of RBCs was calculated by Image J software. Statistical analysis for the relation between the presence of HAS and HU in the NCT was conducted with student t-test and between the percent area of RBCs and HU were analyzed with Pearson correlation coefficient. Results: Among 16 patients with aspirated thromboemboli and high quality CT images, mean age was 71.5 and females were 7. Carotid-T occlusion only was 7, occlusion of middle cerebral artery 5, occlusion of carotid-T and proximal internal carotid artery 3, and occlusion of the basilar and vertebral artery 1. In all patients, TICI scale after thromboectomy was 2b or 3. In NCT analysis, HAS was detected in 10 patients. According to the presence of HAS, maximum HU in the thromboemboli was different significantly (p=0.038), whereas between mean HU and HAS was not (p=0.379). In histologic analysis, the percent area of RBCs was correlated with the maximum HU (p<0.047), not with the mean HU (p=0.658). Conclusion: In acute stroke patients, HAS in the NCT reflects RBCs proportion in the thromboemboli, which is correlated with the maximum HU.
Conclusion: Our results suggest that VEGF may have a role in the formation of CMBs in acute ischaemic stroke. VEGF is a potent inducer of vascular leakiness and its upregulation in acute ischaemic stroke patients may trigger or potentiate CMB genesis in the acute phase. However, this study should be extended to a wider range of acute stroke patients to establish the consistency of our findings.

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**Topography of cerebral infarcts in patients with PFO**

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Background & Aim: Previous studies have focused on the role of the patent foramen ovale (PFO) in the mechanism of stroke. However, the brain imaging features in these patients have not been described in detail. In this study we characterise the infarct topography of stroke patients with PFO.

Method: Retrospective analysis of patients with echocardiographic PFO and stroke at our institution over 9 years. Demographic and risk factors were collected. Infarcts were characterised from MRI scans using an expanded ASPECTS template taking into account both the anterior and posterior circulation. The control group consisted of patients with echocardiographic evidence of PFO without stroke.

Results: Fifty three of 59 (90%) stroke pa-
Patients were aged > 39 years. The distribution of risk factors were hypertension 41%, hyperlipidemia 39%, smoking 36%, ischemic heart disease 33%, diabetes 8% and atrial fibrillation 5%. The distribution of infarct territories were right anterior circulation 30 patients (81% cortical distribution); right posterior circulation 19 patients (22% cerebellum, 12% brainstem, 3% occipital lobe and 3% thalamus); left anterior circulation, 35 patients (92% cortical distribution); left posterior circulation, 21 patients (22% cerebellum, 15% occipital lobe, 8% brainstem, 2% thalamus). Infarcts involving multiple territories were present in 34 patients (57%) of patients. Nine patients (15%) had a single discrete infarct. Stroke patients with PFO were more likely to have hypertension obesity, hyperlipidemia, and smoking history (p<0.05). Hypertension was significantly associated with infarcts involving multiple territories (OR 7.1, 95%CI 1.9-26.1).

Conclusion: We have provided a topographic description of stroke in the setting of PFO. Hypertension is associated with infarcts involving multiple territories and the presence of PFO.

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Post-Processing techniques for MR perfusion and MR Angiography that confirm the presence of borderzone infarction
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Borderzone Infarction accounts for 12% of all infarcts. Historically, aetiology focused research has been restricted by variability in the perfusion territories of the major cerebral vessels. We have devised a robust technique to estimate borderzone regions using existing, well-established MR techniques.

As part of a larger study, that is currently investigating hypotension-induced stroke and borderzone infarction, all patients underwent an acute stroke protocol with the Phillips 3T MRI. All underwent MR perfusion gradient echo imaging with 0.1mmol/kg Gadovist contrast, 17 5mm slices, no gap, at a shortened repetition time of 0.904 seconds. Time of Flight MRA was conducted, as per standard protocol, however 11 minutes acquisition time. Individualised perfusion territory maps were generated using mathlab post processing software from first moment and time to peak data through an iteration process (figure 1). Using MRA data, each vessel was seeded using ITK snap postprocessing software (figure 2). This protocol facilitated the identification of borderzone infarction in 10 patients. The addition of these sequences and processing software significantly increased the examiners capacity to conclusively identify the borderzone regions for each patient. Concordance between methods was excellent.
Confirmation of borderzone infarction has historically proved difficult. More recently elaborate techniques have emerged yet access to such novel techniques is limited. We have utilised existing MR techniques to develop a robust protocol for borderzone estimation.

Method. We searched stroke admissions from 2009-2011 for patients who have had MRI scans and subcortical strokes. Stroke deficits were classified according to the National Institute of Health Stroke Scale (NIHSS). The infarcts were manually segmented, linearly registered into a common stereotaxic space using affine transformation. In a normal subject, the corticofugal fibers were segmented using diffusion tractography. Next, the volume of overlap between the infarct and the corticofugal fibers were calculated. This volume overlap was regressed against motor outcome, controlling for demographic factors such as age, sex, diabetes and hypertension.

Results. There are 57 patients of xxx with mean age 64.3±14.4 year-old. Fifty seven percent of the subjects were males. The distribution of risk factors were hypertension 52.6%, diabetes 28.1%, hyperlipidemia 43.9%, smoker 15.8%, atrial fibrillation 14.0% and ischemic heart disease 17.5%. The multivariate regression model shows that the involvement of fibers from the premotor cortices (slope = 2.89 NIHSS motor score per mm3 track involvement, 95% CI 1.92-3.88) and female sex (difference = -1.16, 95% CI -2.07- -0.25) contribute to a higher NIHSS motor score.

Discussion: The descending motor corticofugal fibers have different affect on motor outcome. Fibers from the premotor cortices have the greatest effect on motor outcome among patients with subcortical stroke.
Utility of CT perfusion compared with SPECT scans in acute stroke patients with the carotid artery or middle cerebral artery disease

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Purpose
The purpose of our retrospective study was to investigate the utility of CT perfusion using whole-brain 320-row area detector for assessing cerebral blood flow (CBF) in acute ischemic stroke patients with the carotid artery (CA) or middle cerebral artery (MCA) disease compared with 99mTc-ECD single photon emission computed tomography (SPECT).

Methods
Included for retrospective analysis were patients, (1) who were admitted from January 2011 to October 2011 due to acute ischemic stroke, (2) who had the carotid artery or middle cerebral artery disease, and (3) who underwent both CT perfusion (CTP) using 320-row area detector CT and 99mTc-ECD SPECT within 3 days of admission. Excluded were patients (1) who underwent emergency reperfusion therapy between CTP and SPECT, (2) had bilateral stenosis/occlusion of the CA or MCA, or (3) who had large old cerebral infarction. Cerebral blood flow (CBF) of CTP and SPECT was measured on the MCA territory in the affected side (Aff-CBF) and in the contralateral side (Con-CBF). Asymmetry index was defined as Aff-CBF divided by Con-CBF. We evaluated Aff-CBF, Con-CBF, and AI of CTP compared with those of SPECT. In addition, we evaluated crossed cerebellar diaschisis (CCD) visually in CTP and SPECT images.

Results
Thirty-six patients were matched to our criteria. Twenty-two patients had the CA lesions and fourteen had the MCA lesions. Age was 71.3±11.4 years (mean±SD), Man(%) was 75%, Right-sided lesion(%) was 39%. The rank correlation coefficient was 0.591 (p=0.000) in Aff-CBF, 0.526 (p=0.001) in Con-CBF, and 0.713 (p=0.000) in AI. CTP showed CCD in 9 cases and SPECT in 8 of the 9 patients (R2=0.77, p=0.000).

Conclusions
CTP using 320 rows area detector CT, particularly AI, had diagnostic performance equivalent to 99mTc-ECD SPECT to assess CBF in acute stroke patients with the CA or MCA disease. CTP was able to find CCD.
Background and purpose
Although decreased perfusion is a commonly accepted mechanism in cerebral watershed infarcts, recent studies suggest that embolism may also be part of their pathophysiology. We sought therefore to correlate embolic and haemodynamic transcranial Doppler characteristics of internal carotid artery (ICA) stenoses to the different types of lesions, territorial or borderzone, on MRI.

Patients and Methods
Consecutive patients presenting a >50% symptomatic ICA stenosis were included. Microembolic signals (MES) detection (60 minutes recording) and measurement of cerebral vasoreactivity (VR) based on the breath holding test were performed by means of transcranial Doppler. Acute lesions present on MRI (DWI sequences) scans were divided blindly into 2 distinct categories, territorial (large, small or subcortical) and border-zone (cortical or internal) and considered for analysis.

Results
A total of 72 ICA stenoses were included. Lesions on MRI were distributed in the following manner: 51 territorial (31.61%, pure) and 37 watershed (17.46%, pure). Impaired VR was found more frequently in higher degrees of stenoses (70-99%: 23/44, 52% versus 50-69%: 4/28, 14%, p<0.001) whereas MES were similarly encountered within the 2 groups (70-99%: 15/44, 34% versus 50-69%: 11/28, 39%, p=NS). Impaired VR was found slightly more often in the borderzone (7/17,41%) than in the territorial group (10/31,32%), however the difference was not significant. MES were present in 39% (12/31) of patients with pure territorial and in 35% (6/17, p) of those with pure borderzones lesions. It is to mention however that MES were more prevalent in the cortical than in internal borderzone infarcts (4/8,50% versus 0/4, p=0.05)

Conclusion
MES and impaired VR are found in similar proportions of most cases of pure territorial or borderzone MRI distribution, suggesting a role of hypoperfusion and embolism in both types of infarcts.

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Persistence of Hyperdense Middle Cerebral Artery Sign on Follow-up CT Scan is Associated with Poor Outcome in Ischemic Stroke Patients Treated with Intravenous Thrombolysis
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Background- Early identification of reliable predictors of functional outcomes is impor-
Conclusion- Persistence of HMCAS on the follow up CT scan in AIS patients receiving intravenous thrombolysis is an early predictor of poor functional outcome at 3-months.

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Automated Detection and Quantification of Acute Infarction by Fuzzy Clustering Method in Diffusion Weighted MR Imaging
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Background
Initial neuroimaging in the acute stage of infarction may predict the prognosis. The current semi-automated method requires time-consuming segmentation of infarct areas and the results have significant inter-rater difference. A more effective automatic segmentation is indicated for its clinical application. To this end, this study developed a fuzzy clustering 3D automatic infarction detection algorithm able to differentiate recent and old infarct lesions in patients with acute cerebral infarction.

Methods
Four male and three female patients, aged 77/11 y. o. (mean/SD), with acute cerebral infarction were recruited, approved by the
Ethics Committee at LandSeed Hospital, Taoyuan, Taiwan. MR data of the patients were acquired on Signa HDxt 1.5T (GE Healthcare, Waukesha, WI). The preprocessing steps corrected for head movement. DWI (diffusion weighted image) and ADC (apparent diffusion coefficient) were registered by rigid registration to the T1W (T1-weighted image) and the skull and background were isolated. After the fuzzy C-means clustering, infarctions were detected based on the specific intensity range in the DWI and then old infarct regions were excluded in the ADC map. Kappa statistics by voxel and Pearson correlation were utilized to assess the agreement between the results from the new approach and the manual semi-segmentation by an independent experienced physician rater by the assistance of MRIcro® software.

Results
The infarct volumes ranged from 4.1 to 482.6 cm³. The kappa values range from 0.87 to 0.96 with a mean of 0.90. The Pearson correlation coefficient of the infarction volume between our automatic algorithm and the semi-automatic segmentation is 0.99.

Conclusion
This study presents a novel computer-assisted diagnosis tool to automatically detect infarct lesions in the whole brain. Future works will enroll more patients to evaluate its sensitivity and specificity in order to facilitate the clinical applications and related studies.

Collateral Circulation in The Asymptomatic Middle Cerebral Artery Stenosis at 7T Magnetic Resonance Angiography

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Background
It is common that physicians are faced with
patients who have severe steno-occlusion of intracranial arteries in absence of clinical symptoms. When this situation occurs, clinicians are in troubles to make decisions whether going further invasive or not. Using non-invasive MRA method at 7T MRI, we would like to reveal collateral vessels in patients who were clinically asymptomatic with middle cerebral artery (MCA) stenosis or occlusion at 1.5T or 3T MRA.

Methods
Nine patients (5 males, 4 females) who complained of headache or dizziness and then had invisible MCA at the previous 1.5T or 3T MRA were included. All of them underwent 7T MRA and we observed the presence of collateral circulation and analyzed vessel densities around the steno-occlusive MCA with a segmentation program, developed as a plug-in to ImageJ. Wilcoxon signed-rank test was used to determine the differences between MRA techniques.

Results
We identified the following clinical risk factors: hypertension (3/9, 33.3%), diabetes (3/9, 33.3%), hypercholesterolemia (4/9, 44.4%), smoking (1/9, 11.1%), white matter ischemic change (4/9, 44.4%). In the result of 7T MRA, numerous collateral vessels were observed, compared with 1.5T or 3T MRA. These 7T MRA images were also comparable to conventional angiography. Mean vessel densities within a imaging volume were 1.78±0.72 and 3.5±2.52 at 3T and 7T MRA, respectively (P = 0.018).

Conclusions
We demonstrated that 7T MRA visualizing collateral circulations could provide valuable information of the reason why the preservation of brain from ischemic insults in the asymptomatic MCA steno-occlusion has been possible.

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Blooming Artifact on GRE-MRI as Predictor of Hemorrhagic Transformation and Poor Outcomes after Ischemic Stroke
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Background & Purpose: Previous studies have reported an association between blooming artifact on MRI and hyperdense MCA sign on non-contrast CT. However, it is unknown if blooming artifact can predict the risk of hemorrhagic transformation (HT), poor outcome and death in ischemic stroke.

Subjects & Methods: Using our existing database of consecutive patients with symptoms of cerebral ischemia admitted to our hospital, we identified those with persisting MCA occlusion (MCAO) on MRA/MRI within 48 hours from symptom onset. Gradient-recalled echo (GRE) sequences were independently reviewed by a neuroradiologist for the evidence of blooming artifact, defined as an area of hypointensity within the proximal MCA that has increased diameter compared to the contralateral MCA. Logistic regression was used to assess the relationship between the blooming artifact and hemorrhagic transformation, adjusting for age and baseline NIHSS.

Results: Of 450 consecutive patients with stroke or TIA (52% men; mean age 62+/− 16yrs; baseline median NIHSS 9, IQR 3-16; 10% TIA), 32 (7%) had persisting MCA occlusion and complete MRI. Blooming artifact was found in 14 (44%) patients with MCAO. Exposure to blooming artifact was not an independent significant predictor of hemorrhagic transformation (OR=1.04, 95%CI 0.22-4.91, p=0.96). After adjusting for age and admission NIHSS, blooming artifact showed a trend towards an association with HT (OR=3.10, 95%CI 0.27-35.19, p=0.36). Blooming artifact did not predict poor outcome (mRS >=3), p=0.96 or death, p=0.11. Conclusion: Our study did not find blooming artifact to be an independent significant predictor of hemorrhagic transformation and outcome. However, post-hoc sample size calculations suggest that 84 patients are needed to adequately power a study to detect a significant association. One potential confounder in our study was that we compared outcome in patients with persisting arterial occlusion, which itself is a predictor of poor outcome.

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Probabilistic Imaging of Virchow Robin Spaces

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Introduction

Virchow-Robin spaces (VRS) have been associated with age, blood pressure, and small vessel disease. The prevalence and location of VRS has been assessed by visual rater based scores, however, there is no voxel-based reference for presence of VRS in standard space so far. We constructed a
3D-map showing the probabilistic distribution of VRS in standard brain space based on a large sample of normal brain MRI.

Methods and Materials
VRS were evaluated by high-resolution 3D MR imaging in 400 healthy subjects enrolled in the SEARCH study. VRS as low as 1mm in largest diameter were included and segmented. Image data were obtained on a 3 Tesla system with high-resolution structural 3D-T1-weighted, T2-weighted and fluid-attenuated inversion recovery (FLAIR) imaging sequences. Segmentation was performed by a trained reader according to a strict protocol defining the criteria of a VRS included for analysis: 1) screening of brain extracted T2 weighted images in comparison to co-registered 3D-T1 and FLAIR images; 2) at least 1mm x 1mm in two dimensions; 3) T2 hyperintensity (comparable to CSF) within brain tissue with sharp boundary; 4) T1 hypointensity; 5) FLAIR hypo- or isointensity (for small VRR), no hyperintensity, no evidence for gliosis; 6) no evidence for ischemic or inflammatory etiology. Binary maps of VRS were affine registered to MNI-152 space with non-linear refinement (FSL 4.1) and a probabilistic image of VRS distribution was calculated.

Results
Figure 1 shows the probabilistic distribution of VRS in standard MNI-152 space based on 400 healthy brains from a well characterized population study (SEARCH). Voxel wise probability was distributed symmetrically and highest within basal ganglia (up to 52%).

Conclusion
We present the first published 3D-map showing the probabilistic distribution of VRS in standard brain space. The map may be used in further studies to derive rater independent image parameters for VRS analysis using voxel based morphometry.
Background
Ischemic stroke is one of the leading causes of mortality and acquired disability worldwide. Brain tissue that has become ischemic during the stroke event alters its metabolism. Here, we used 1H- and 31P-Magnetic Resonance Spectroscopic Imaging (MRSI) to study these changes in vivo.

Methods
In our ongoing study, we have analysed the data of 9 patients with ischemic stroke. Patients were studied shortly after stroke onset (median duration 6 days). Data was acquired using a 3T-MR-scanner (Magnetom Trio, Siemens Medical AG, Erlangen, Germany) with double tuned 1H/31P volume head coil (Rapid Biomedical, Wurzburg, Germany).

Results
In 1H-MRSI, we found a significant reduction of N-acetyl-aspartate (NAA). Choline and creatine compounds were reduced as well. In 31P-MRSI, we found highly significant reductions of phosphocreatine (PCr) and ATP and significant reductions of glycerophosphocholine and phosphocholine. We also observed a trend towards increased inorganic phosphate (Pi).

Conclusions
Our preliminary results show that NAA, proposed as an important marker of neuronal integrity is decreased which is in line with neuronal cell damage in the affected area. Highly significant reductions in ATP-levels and PCr together with a trend towards increased Pi reflects an impaired energy metabolism in infarcted tissue. Significant reductions of glycerophosphocholine and phosphocholine are in line with the choline levels decrease monitored with 1H-MRSI. This indicates changes in membrane metabolism which may be related to the altered energy metabolism.

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Paramagnetic labelling of haematopoietic CD34+ cells and their identification with magnetic resonance imaging after stroke: data from the STEMS-2 trial

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Background
In-vivo tracking of iron labelled stem cells with serial MRI is feasible in experimental stroke but has never been attempted in the human stroke brain.

Methods
Patients enrolled into STEMS-2 (Stem cell Trial of recovery EnhanceMent after Stroke 2), an RCT assessing the safety of granulocyte-colony stimulating factor (G-CSF) in subacute stroke, were invited to partake in CD34+ haematopoietic stem cell (HSC) labelling. Recruits received G-CSF (10µg/kg, subcutaneously) or placebo for 5 days 3-30 days post ictus. On day 6, mobilised HSCs were extracted from the patient, paramagnetically labelled and re-infused intravenously. MRI T2* imaging (days 0, 10-12, 90) tracked iron-labelled cells. HSC counts were measured using flow cytometry.

Results
8 participants (6 G-CSF, 2 placebo) with a mean age 75 (SD 7), of whom 50% were male, undertook cell labelling 14 days (SD 3.8) post ischaemic stroke. In G-CSF treated participants, between 50–430 x104 HSCs were harvested for re-infusion from 100-200 ml of whole blood. HSC harvest correlated significantly with day 5 peripheral blood HSC count (Spearman’s rho 0.83, p=0.01). One recruit developed a hypodensity compatible with iron-deposition within the infarct evident on day 10 and 90 T2* scans. Three subjects had hypodensities in their infarct zones compatible with haemorrhagic transformation at days 0, 10 and 90. The remaining four participants had no hypodensities in their infarct zones at any time point.

Conclusions
Post-stroke paramagnetic CD34+ cell labelling appears safe and feasible. There is suggestive evidence from one patient that labelled HSCs migrate to the ischaemic lesion.

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3-T high b-value diffusion-weighted MR imaging in hyperacute ischemic stroke
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Background
Diffusion-weighted MR imaging (DWI) is the key method for detecting ischemic lesions within the first hours after stroke onset. B values applied in stroke diffusion studies are usually in the range of 800-1500 s/mm2, but progress in MR technology permits higher b values. High b-value DW sequences have already been used for imaging acute ischemic stroke at 1.5T and 3T, but it is still uncertain whether high b-value DW sequences at 3T improve detection of hyperacute (within 6 hours) ischemic lesions.

Methods
At 3T, DWI was performed in 104 consecutive patients referred with a clinical diagnosis of hyperacute stroke using conventional MR sequences as well as echo planar DW sequences. The examination included a usual DW sequence (b = 1000 s/mm2) and two high b-value DW sequences (b = 3000 s/mm2 and b = 5000 s/mm2). Quantitative and qualitative evaluation was performed.

Results
On b = 3000 s/mm2 images most lesions (281 lesions) were detected followed by b = 5000 s/mm2 images (250 lesions) and b = 1000 s/mm2 images (216 lesions). Most of the additionally detected lesions were small (<1 cm). Delay before MRI (30 to 337 minutes) did not statistically significantly influence these results. Contrast ratio was the highest on b = 5000 s/mm2 images (0.4243) followed by b = 3000 s/mm2 images (0.3868) and b = 1000 s/mm2 images (0.1886). Contrast ratios were higher at longer delay before MRI. Contrast-to-noise-ratio and signal-to-noise-ratio were higher on b = 1000 s/mm2 images (69.24/216.92) than on b = 3000 s/mm2 images (49.05/87.51) and b = 5000 s/mm2 images (40/66.24). Lesion conspicuity and extent was highest on b = 5000 s/mm2 images followed by b = 3000 s/mm2 images.
and $b = 1000 \, \text{s/mm}^2$ images. Estimation of infarct extent (compared to follow up CT and MR) was the best on $b = 5000 \, \text{s/mm}^2$ images followed by $b = 3000 \, \text{s/mm}^2$ images and $b = 1000 \, \text{s/mm}^2$ images. With increasing $b$ value, DW images appeared noisier and white matter tracts became progressively hyperintense.

Conclusion
At 3T, high $b$-value DW sequences ($b = 5000 \, \text{s/mm}^2$ and $b = 3000 \, \text{s/mm}^2$) were superior to $b = 1000 \, \text{s/mm}^2$ DW images in diagnosing hyperacute ischemic lesions.

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Incidental findings on Pre-thrombolysis NCECT and CT Angiogram
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Introduction: Incidental clinically relevant or irrelevant findings on pre-thrombolysis Non-contrast enhanced CT (NCECT) are not unusual, but the consequence of missing the clinically relevant findings may be fatal. This is in the context of the narrow therapeutic index of the thrombolytic agent and the urgency with which therapeutic decisions are taken. Inclusion of baseline CT Angiogram in the protocol may provide additional information.

Method: We retrospectively analysed, a prospectively collected data of patients admitted in our hyper-acute stroke unit from August 2010 and May 2011. This followed a change in protocol from baseline NCECT, to baseline plain CT and CT Angiogram (CTA) prior to making therapeutic decisions. The 64 slides MDCT scan provide images from the arch of the aorta to the intracranial vessels (information on soft tissues and bony abnormalities inclusive).

Results: Incidental findings were noted in 33 out of 323 (10.2%) patients. The percentage incidental findings of the total number of patients seen during this period and the percentage of total anomaly incidence were Vascular {10(3.10%); 30.3%}, Sinuses {7( 2.17%);21.2%}, Bony {7(2.17%); 21.2%}, Brain parenchyma {4(1.24%);12.1%}, Cysts in ventricles {2(0.62%); 6.0%}, Skin and soft tissues {2(0.62%); 6.0%}, Meninges {1(0.31%);3%} respectively (details of anomalies in each group to be presented).

Conclusion: The result showed that 1 of every 10 patients admitted had an Incidental finding, and 1 out of every 30 patients had findings of vascular origin. Inclusion of CTA in the baseline pre-thrombolysis protocol will assist in increasing the detection of unexpected findings, especially vascular anomalies (3%), which as a result will assist in avoiding fatal consequences.

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Prevalence of and risk factors for microbleeds on magnetic resonance imaging in a community-dwelling Singaporean Chinese
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Background:
Advances in magnetic resonance imaging (MRI) have provided novel markers for small vessel disease which include cerebral microbleeds (CMB). However, data from non-Caucasian populations on CMB are scanty. Therefore, we aim to examine the prevalence of and risk factors for CMB in community dwelling Singaporean Chinese.

Methods:
This study is part of the on-going Singapore Chinese Eye Study. Selected subjects aged above 60 years were invited to undergo clinical assessments and brain MRI. Using the Brain Observer Microbleed Scale (BOMBS), CMB were visually graded on susceptibility weighted imaging (SWI) sequences. Prevalence rates were computed per 5 year age and gender strata. The associations between systemic risk factors and markers of cerebrovascular disease with presence and location of CMB were assessed using logistic regression. Odds ratios (OR) with 95% confidence intervals (CI) were computed adjusting for age and gender, and additionally for mean arterial blood pressure, serum total cholesterol, fasting blood glucose and smoking.

Results:
A total of 265 subjects were included for the present analysis. Sixty subjects (prevalence 22.6%, 95%CI 18.0-28.1%) were diagnosed with CMB, of whom 43 (72%) had CMB only in the lobar regions. Prevalence of CMB increased from 14.3% in the age category 60-64 years to 31% in those aged 75 years and over. Age (OR per year increase: 1.07; 95% CI: 1.01–1.13), lacunar stroke (OR: 4.93; 95% CI: 1.95–12.48) and significant deep white matter lesions (OR: 2.95; 95% CI: 1.36–6.40) were associated with any CMB or lobar CMB. No association was found between systemic risk factors and cerebrovascular disease with CMB in deep or infratentorial regions after adjustment for demographic and vascular risk factors.

Conclusions:
In this study, among a Singaporean community-dwelling Chinese population, we report an overall prevalence of CMB of 23%. Risk factors related to any or lobar CMB include age, the presence of lacunar stroke and white matter lesions. These data on CMB in Asians are in concordance with findings from previous studies in Caucasian populations.
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Brain perfusion correlation to extracranial vessel stenosis, acute stroke study
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Aim. To describe the brain perfusion patterns, using multimodal imaging technique in acute stroke patients with known atherosclerotic changes of brachiocephalic vessels.

Materials and methods. A 64 row multislice CT system was used for the evaluation of 70 acute stroke patients 9 hours after ictus, using multimodal imaging (CT, CTA, CTP) and follow up CT within 24 hours. Atherosclerotic changes were evaluated by CTA.

Results. Increased mean transit time (MTT) indicate delayed blood supply. This pattern may be false-positive in hypoperfusion, e.g. severe extracranial carotid stenosis/occlusion. Our study data correlated with latter in 39% cases of ICA occlusions. On CBF maps decreased values represent decreased blood flow to brain parenchyma. CBV maps are likely the best estimate of collateral flow, if decreased – it is the best predictor for final infarct volume and we used the relative values for quantification. If the abnormal regions on CBV and CBF match - this represents completed infarct without good collaterals. It correlates with our data with completed or partial necrosis in 93% of all ICA occlusions. We revealed good collaterals on CTA imaging that correlated in 93% to perfusion maps. Penumbra zone in 4-6 hours correlated with extracranial vessel stenosis stage for less than 50% at the origin of the ICA in 53% cases, suggesting of underlying hypoperfusion due to effective collateral blood supply.

Conclusions. Optimal image interpretation requires selection of appropriate thresholds and choice of most appropriate parameter for definition of penumbra and collaterals. Brain perfusion patterns correlate with vessel stenosis stage and localization. Long term brain hypoperfusion due to stenosis of extracranial vessels may increase possibility to have wider time window to treatment in acute stroke patients.

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Estimation of Ischemic Lesion Age by MRI: DWI has FLAIR
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Background:
In patients with ischemic stroke and positive diffusion weighted imaging (DWI), negative fluid-attenuated inversion recovery (FLAIR) imaging has been shown to predict a time of stroke onset below <4.5 h. However, visual and automated analysis of FLAIR images is challenging, whereas DWI analysis can be performed threshold based. We tested the hypothesis that FLAIR positive lesions can be predicted by a quantitative DWI analysis.

Methods:
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**R2’ heterogeneity in Acute Ischemic Stroke Patients**

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Background: Oxygen extraction fraction (OEF) increases in tissue at risk of infarction and may be an indicator of tissue metabolic status in acute ischemic stroke. Some investigators have suggested measuring OEF indirectly from R2’, which is a reflection of both OEF and venous blood volume. We investigated the utility of R2’ in stroke patients imaged within 48 hours of symptom onset.

Methods: Acute adult ischemic stroke patients presenting with acute lesions greater than 5 cm³ were prospectively enrolled in an MRI study of stroke patients within 48 hours of symptom onset. MRI studies were performed on 3T systems. Only the subset

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DW and FLAIR images of ischemic stroke patients with symptom onset <12 hours and positive DWI were included (2 centers: Group A, 1.5 T MRI; Group B, 3 T MRI). The slice with the maximum DWI lesion extent was used for further analysis. FLAIR and DWI lesions were visually delineated. 6 mm circular ROIs were placed within the DWI lesion and labeled according to their FLAIR pattern (FLAIR positive or negative). DWI values were expressed as relative values (mean ROI value normalized to the mean value of the unaffected hemisphere). The prediction of a FLAIR hyperintensity by a relative DWI intensity was tested by receiver-operating-characteristic (ROC) analysis.

Results:

Group A: 50 patients (28 FLAIR positive, mean age 58 years, mean time stroke-MRI: 3.3 hours, mean NIHSS: 10; FLAIR+ ROIs n=632 and FLAIR- ROIs n=702).

Group B: 47 patients (27 FLAIR positive, mean age 71 a, mean time stroke-to-MRI: 3.3 h, mean NIHSS: 8; FLAIR+ ROIs n=257, FLAIR- ROIs n=377). ROC analysis identified in group A/group B: a relative DWI threshold of 153%/151% to predict FLAIR hyperintensities with a sensitivity of 75%/81%, a specificity of 84%/87%, a positive-predictive value of 81%/80% and a negative-predictive-value of 81%/86% (AUC: 0.84/0.87).

Conclusion:

DWI intensities below 153% (1.5 T) and 151% (3 T) can predict FLAIR negative lesions. This points at a possible role of a quantitative DWI analysis to identify an early lesion age. The prediction of lesion age by DWI will be assessed in a larger multicenter sample.
of subjects who received asymmetric spin echo (ASE) sequence was analyzed. $R_2'$ was calculated from ASE data acquired at -50 and -25 ms echo shifts on a voxel-wise basis after motion correction and smoothing, and averaged over 9 acquisitions. DWI was also acquired in these subjects. $R_2'$ maps and follow-up images, when available, were co-registered to the DWI (MNI Autoreg).

Results: 7 subjects met the inclusion criteria (4 males/3 females). Age (mean±standard deviation) was 66.7+/−11.0 years old. Time-to-MRI was 33.1+/−9.2 h. Three patients were imaged after thrombolytic therapy. Excluding regions of hemorrhage, patterns of $R_2'$ varied from increased to decreased to normal. Three subjects exhibited both regions of increased and decreased $R_2'$, two subjects demonstrated only decreased regions, one subject showed only increases and one subject’s $R_2'$ map was uninterpretable due to artifacts.

Conclusions: Regions of elevated $R_2'$ are consistent with tissue that is at risk of infarction, either due to increased CBV (result of compensatory vasodilation) or increased OEF. Decreased $R_2'$ can potentially reflect two disparate states of tissue status – tissue that is already dead (reduced OEF) or tissue likely to survive (increased CBF). Future studies should include measures of CBF and CBV to better discriminate tissue status.

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Inflammation in the penumbra: a clinical 11C-PK11195 PET (11C-PK) study


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Background: In all species, microglial activation (MA) develops within the infarct, where it clears cell debris. In rodents, MA also prevails in the rescued penumbra, exerting neurotoxic and pro-repair effects. Here we used multimodality imaging to test the hypothesis that MA affects the rescued penumbra in man, in proportion to acute hypoperfusion.

Methods: We prospectively recruited 16 pts with acute MCA stroke (9M, 7F; median age 66yrs; median NIHSS 12, range 3-21;12 thrombolysed) and good recovery (median NIHSS 1, range 0-12). At ~20d, pts underwent both FLAIR and 11C-PK to map final infarct and MA, respectively. 11C-PK binding potential (BP) maps were produced using ipsilateral cerebellum as reference, and imaging data were coregistered. For each pt, voxels within the search volume (MCA mask - infarct ROI, dilated 9mm to account for partial volume effects) with significantly increased BP (p<0.01 relative to 10 aged-matched controls) were identified on each side. The relationship between BP and acute perfusion within the search volume was assessed on voxel datasets binned by MTT delays in a subset of 14 pts in whom CT perfusion (2X10mm slices) <4.5hrs of onset showed penumbra, based on validated thresholds.

Results: Across pts, there was significantly more high BP voxels in the affected relative to non-affected non-infarcted mask (p=0.02, Wilcoxon). Visual inspection revealed clear-cut MA in non-infarcted penumbra in 2/14 pts, and the hypothesized positive correlation between acute-stage MTT and BP was significant also in 2/14 pts.

Conclusion: This novel study documents the presence of MA in non-infarcted brain areas following MCA stroke. Perhaps due to the limited FOV of CTp used and the conservative analysis excluding peri-infarct for methodological reasons, only small amounts of MA were present in most cases, and the relationship with acute penumbra was not universal. Nevertheless, our findings suggest the presence of MA in the salvaged penumbra in some cases.
Poster Session Red
Lisbon, Portugal 2012

Observational sifap1 study cohort (age range 18-55 years; n=5024) with available GRE, DWI and FLAIR MRI. Two blinded experienced readers (GJJ, CE) searched for VS on the MRI scans of patients in order of GRE, FLAIR and finally DWI unaware of any clinical or other information. Subsequently MR-angiograms were reviewed to determine the rate of false-positive interpretations. In cases of ambiguity or disagreement a further expert (FF) was conferred and consensus was reached.

Results
We found proximal VS in 6.8% (n=71) and distal VS in 6.2% (n=65) of patients. Proximal vessel signs were seen more frequently in GRE than in FLAIR MRI with numbers of 4.4%, 0.2% and 0.8% for the middle, the anterior and the posterior cerebral artery for GRE, and 2.8%, 0.3% and 0.5% for FLAIR MRI respectively. Distal VS were seen more frequently in FLAIR (5%) than in GRE (1.3%) sequences. Further analysis regarding vessel status, sensitivity and specificity of VS, stroke and MRI characteristics related to VS are ongoing and will be presented at the ESC.

Conclusions
In a large cohort of young patients with first acute ischemic stroke, proximal and distal vessel signs are rare.

Background and Purpose
Vessel signs (VS) in stroke MRI can be categorized in proximal and distal VS which appear with a prominent hypointense signal loss on gradient echo (GRE) sequences and with a hyperintense signal enhancement on FLAIR. Suggesting vascular occlusion in proximal and/or low flow in distal vessels such VS have been described mostly in populations of patients with acute middle cerebral artery (MCA) ischemic stroke. The likelihood and ability of different MRI sequences to detect VS in the anterior and posterior circulation especially in young stroke patients is unknown.

Methods
We analysed 1047 patients with first-ever ischemic stroke from the prospective observational sifap1 study cohort (age range 18-55 years; n=5024) with available GRE, DWI and FLAIR MRI. Two blinded experienced readers (GJJ, CE) searched for VS on the MRI scans of patients in order of GRE, FLAIR and finally DWI unaware of any clinical or other information. Subsequently MR-angiograms were reviewed to determine the rate of false-positive interpretations. In cases of ambiguity or disagreement a further expert (FF) was conferred and consensus was reached.

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Conclusions
In a large cohort of young patients with first acute ischemic stroke, proximal and distal vessel signs are rare.

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Decrease of leptomeningial high signal intensity (ivy sign) on FLAIR images in patients with Moyamoya disease after STA-MCA anastomosis
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BACKGROUND An ivy sign is considered to represent diffuse leptomeningeal collaterals found on FLAIR images of patients with Moyamoya disease. Unilateral hemispheric ivy proliferation correlated highly with the existence of an ipsilateral decreased cerebral vascular reserve (CVR). However, the correlation between ivy sign and cerebral perfusion status has not been fully evaluated. We evaluated to characterize ivy sign on FLAIR images in Moyamoya disease and compare this finding with hemodynamic alterations on perfusion MRI and SPECT obtained before and after STA-MCA anastomosis. MATERIAL AND METHODS From Sep 2010 to Jan 2012, 25 patients of ischemic stroke with hemodynamic insufficiency were treated with EC-IC bypass. Among them, 6 patients with angiographically confirmed Moyamoya disease underwent STA-MCA anastomosis. The presence of ivy sign on FLAIR images on MRI was classified as 'negative', 'minimal' and 'positive'. We evaluated the relationship between ivy sign and findings of SPECT, including CVR and cerebral perfusion status before and after STA-MCA anastomosis. RESULTS Minimal or positive ivy sign was seen in 5 (83%) of 6 patients, and 8 (66%) of 12 hemispheres. In SPECT, CVR in the areas with positive or minimal ivy sign was lower than that in the areas with negative ivy sign. In perfusion MRI, cerebral perfusion in the areas with positive or minimal ivy sign was also lower than that in the areas with negative ivy sign. 7 hemispheres in 6 patients with Moyamoya disease underwent STA-MCA anastomosis. After 3 to 12 month follow-up, ivy sign decreased in 6 hemispheres demonstrating ivy sign. SPECT and perfusion MRI also demonstrated apparent hemodynamic improvement in areas demonstrating disappearance or decrease of ivy sign. CONCLUSION Ivy sign on FLAIR image is seen in areas with decreased cerebral perfusion and decreased CVR. After STA-MCA anastomosis, ivy sign disappeared or decreased in hemispheres demonstrating ivy sign. Although need of further study, postoperative changes in the ivy sign can be used as a marker for identifying improved hemodynamics and also for testing the effectiveness of STA-MCA anastomosis.

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MEASUREMENT OF THE EARLY RATE OF CT CONTRAST EXTRAVASATION IN PATIENTS WITH INTRACEREBRAL HEMORRHAGE: A CT PERFUSION STUDY

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Background: Knowing the rate of contrast extravasation may provide insight into the pathophysiology of hematoma expansion...
by identifying the target abnormality most likely to contribute to hematoma growth. This study assessed whether CTP derived permeability (PS) measures can distinguish between different rates of contrast extravasation for patients with and without CTA Spot Sign or post contrast CT contrast leakage (PCL).

Methods: We report CT perfusion (CTP)-derived blood brain barrier (BBB) permeability findings of 16 consecutively screened ICH patients with and without confirmed contrast extravasation within 3 hours of symptom onset. Four regions of interest were placed on perfusion-weighted average images: 1) Extravasation positive regions (CT angiographic Spot Sign and post contrast leakage (PCL)), 2) mirrored contralateral hematoma volumes and 3) background hematoma excluding extravasation and 4) region within hematoma volume for patients without extravasation. Baseline and follow up hemorrhage volumes were measured.

Results: Mean PS was 3.8±2.9 ml x min^-1(100g)^-1, 0.12±0.39 ml x min^-1(100g)^-1, 0.10±0.26 ml x min^-1(100g)^-1, and 0.38±0.26 ml x min^-1(100g)^-1 in the extravasation positive, hematoma excluding extravasation, contralateral mirror regions, and extravasation negative patients, respectively. The extravasation positive group was significantly different from all other groups (p<0.05). Within the extravasation positive group, mean PS of CTA Spot sign and PCL was 6.5±1.6 ml x min^-1(100g)^-1 and 0.95±0.39 ml x min^-1(100g)^-1 respectively (p<0.05). Mean hematoma volume increased from 34.1±41.0 ml to 40.2±46.1 ml in extravasation positive patients and decreased from 19.8±31.8 ml to 17.4±27.3 ml in the absence of extravasation (p<0.05).

Conclusion: A gradation of PS values in CTA and post contrast CT detected lesions and patients without extravasation. This information could be used to guide hemostatic treatment during the acute stroke stage.

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Arterial spin labelling MRI demonstrates delayed bolus arrival times in acute stroke patients.

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Introduction: Arterial spin labelling (ASL) MRI provides information on tissue perfusion by consecutive readout of labelled blood captured in arteries or in the microvasculature. We used a single-shot 3D readout technique for ASL with multiple inflow times (TI) to evaluate the severity of hemodynamic compromise in acute stroke patients in comparison to dynamic susceptibility contrast (DSC) perfusion imaging.

Patients and Methods: Thirty-five patients (mean age 66y.) with acute hemispheric stroke were examined with a standard MRI protocol at 1.5 Tesla including time-of-flight angiography (TOF-MRA), diffusion imaging (DWI) and DSC. ASL perfusion measurements were obtained using multiple TI ranging from 250 ms to 2500 ms with region of interest (ROI)-based calculation of bolus arrival time (BAT) and of cerebral blood flow (CBF).

Results: BAT was delayed in ROIs of ischemic territory (646.89 ± 206.24 ms vs. 498.87 ± 143.18 ms; p=0.0002) (Figure). Correspondingly, CBF was reduced with an ischemic/normal ratio of 0.91 ± 0.24 (p=0.01). Although there was only a weak correlation between ASL and DSC parameters, receiver operating curve analysis revealed a high discriminatory power for BAT to distinguish ischemic from normal brain tissue.

Conclusion: ASL perfusion imaging with multiple TI allows the contrast free assessment of BAT and CBF in acute stroke patients. In particular, delayed BAT values reliably demonstrate areas of hemodynamic impairment corresponding with DWI and DSC findings.

CT perfusion in acute ischemic stroke – feasibility and diagnostic accuracy
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Background: CT Perfusion (CTP) is rapid and accessible for emergency ischemic stroke diagnosis. We assessed the feasibility of introducing CTP and diagnostic accuracy versus non-contrast CT (nCT) at our hospital.

Methods: CTP was introduced January 2009 (Siemens 16 slice scanner, 2x24mm slabs). All patients presenting <9hr from stroke onset or with wake-up stroke were eligible unless they had eGFR<50mL/min or diabetes with unknown eGFR. nCT was assessed by a radiologist and stroke neurologist for early ischemic change and hyperdense arteries. CTP was assessed for...
Prolonged time to peak and reduced cerebral blood flow. Technical adequacy was defined as 2 CTP slabs of sufficient quality to diagnose stroke.

Results: Between Jan 2009-Sep 2011, 1152 ischemic stroke patients were admitted, 475 (41%) were <9hr/wake-up onset. Of these 276 (58%) had CTP. Reasons for not performing CTP were diabetes with unknown eGFR (48 [10%], only 14 actually had eGFR <50, none <30mL/min), known kidney disease (36, [8%]), established infarct on nCT (27 [6%]), posterior circulation syndrome (25 [5%]), patient motion/instability (16, [3%]). The remainder were excluded based on clinician discretion (47 [10%]). CTP was more frequently diagnostic than nCT (80% vs 50%, p<0.001). Non-diagnostic CTP was due to lacunar infarction (28 [10%]), infarct outside slab coverage (21 [8%]), technical failure (4 [1%]) and reperfusion (2 [0.7%]). Normal CTP in 87/87 patients with stroke mimics prevented unnecessary tPA. CTP technical adequacy improved from 56% to 86% (p<0.001) after the first 6 months. Median time for nCT, CTP and arch-vertex CT angiogram (including processing and interpretation) was 12min. No clinically significant contrast nephropathy occurred.

Conclusion: CTP in suspected stroke is widely applicable, rapid and increases diagnostic confidence. Unexpected eGFR<30mL/min is uncommon. Increased brain coverage with new scanners and less conservative eGFR criteria may further increase utility.

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**Post contrast FLAIR reveals Blood-Brain-Barrier Dysfunction in Patients with Microbleeds and Acute Cerebral Ischemia or Brain Hemorrhage**

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Background: Microbleeds are frequently detected on T2* MRI. They are indicators of leaky cerebral vessels in patients with hypertension and cerebral amyloid angiopathy. Recently contrast enhanced fluid-attenuated inversion recovery (FLAIR) has gained attention as dysfunction/damage to the BBB can be visualised by leakage of contrast agent into the CSF space. We evaluated prospectively patients with microbleeds and acute cerebral ischemia or hemorrhages with a stroke MRI protocol including a post contrast FLAIR sequence.

Methods: MRI examinations were performed on a 3T scanner (Skyra, Siemens, Erlangen). A total of 21 patients with microbleeds and acute ischemic stroke (n=) or acute brain hemorrhage (n=) were imaged within 72 hours after symptom onset. MRI protocol: diffusion-weighted imaging (DWI), fluid-attenuated inversion recovery (FLAIR), MR-angiography, T2*-, T2- and T1-and susceptibility-weighted imaging (SWI), contrast-enhanced perfusion-weighted imaging (PWI) was performed and followed by, T1 and FLAIR. In addition to stroke aspects, images were analyzed with regard to signs of a hemorrhagic
transformation in SWI and signs of a BBB-dysfunction in contrast-enhanced T1 and FLAIR.

Results: Sulcal contrast enhancement was identified in 14/21 patients with microbleeds and acute ischemia or hemorrhage. Contrast enhancement was seen in the area of the primary lesion and or remotely. No signs of contrast enhancement were seen on T1-weighted MRI.

Conclusions: Post-contrast FLAIR identifies BBB dysfunction already detectable minutes after contrast agent application in a high percentage of patients with microbleeds and acute cerebral ischemia or brain hemorrhages. This indicates that BBB defects do occur in this patient group and can be visualised with MRI. Vascular integrity imaging with post contrast FLAIR MRI may gain importance for diagnostic and safety aspects in patients with microbleeds.

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A likelihood ratio map to predict infarct risk with the presence of ischemic penumbra
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Background
The ischemic penumbra defines the cerebral tissue which can be salvaged with prompt reperfusion. This is defined by thresholded volumes of perfusion defect based on magnetic resonance imaging (MRI) or computer tomography (CT) perfusion. This volume based approach excludes consideration of regional difference such as variation in vascular supply relating to the degree of leptomeningeal anastomoses. Hence a voxel based method may help to clarify tissue fate in different brain regions. We hypothesis that the likelihood of tissue infarction differs depend on the brain region.

Method
Ischemic stroke patients presented within 4.5 hours of onset, received tissue plasminogen activator (tpa) with middle cerebral artery (MCA) occlusion on CT angiography and had CT perfusion (64 multirow scan) were recruited. Ischemic penumbra was defined as region of perfusion defect (Tmax > 2 seconds) not overlapped by the infarct core (cerebral blood volume > 2.5 seconds). Final infarct was assessed by MRI beyond 3 months from onset. Positive likelihood ratio for infarction (PLR) was generated at a voxel level, taking into account the relationship between the finding of penumbra and infarct at a given voxel. We defined voxels with PLR between 5-10 as providing useful clinical information with regards to risk of infarction; and voxels PLR > 10 as highly likely to progress to infarction.

Result
19 patients were studied with median age of 66 years (10 males). The regions within the penumbra supplied by the deep MCA compartment (striatocapsular and internal watershed regions) had PLR values > 10 while the more superficial compartment has PLR range of 1.3-5.0. The posterior temporoparietal region had PLR < 2.
Conclusion
The deep compartment of the MCA territory has very high PLR and is most likely to progress to infarction despite receiving tpa. A likelihood ratio approach may help to refine the zone least likely to infarct, the penumbra and the infarct core on CT perfusion imaging.

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Decreased internal cerebral vein filling in acute ischemic stroke.
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BACKGROUND: CT radiographic signs of cerebral infarction focus primarily on parenchymal changes and arterial lesions. Little is known about venous hemodynamics in acute ischemic stroke. METHODS: In this retrospective study we report multimodal CT findings in 183 patients presenting via Acute Stroke Protocol within 4.5 hours of neurological symptom onset. CT angiograms were examined for changes in opacification of internal cerebral veins (ICVs). Interhemispheric symmetry of ICV filling was determined visually, then quantified in Hounsfield units. Electronic hospital records were reviewed for discharge diagnosis and details pertaining to initial patient assessment. Formal Neuroradiology reports were consulted for evidence of parenchymal changes, as well as presence and location of compromising arterial lesions. Associations of ICV filling status with final diagnosis, clinical severity of stroke (NIHSS), CT-ASPECTS, and site of arterial occlusion were determined.

RESULTS: Decreased ICV filling correlated strongly with ipsilateral acute ischemic stroke (P<0.0001), yielding a sensitivity of 31%, specificity of 93%, and positive predictive value of 87%. Odds ratio for any territory stroke was 6, and anterior circulation stroke - 12 (P<0.0001). Patients with decreased ICV were found to have significantly larger interhemispheric ICV opacification differences than the symmetric group (P<0.0001), and presented with more severe neurological impairment (NIHSS score, P<0.0001), despite comparable ASPECTS scores on initial imaging assessment (P=0.211). Decreased venous filling was more likely to be associated with proximal arterial occlusive lesions, in contrast to predominance of more distal or no lesion findings in stroke patients with symmetric ICVs.

CONCLUSION: The finding of decreased ICV filling in patients with acute neurologic symptoms presenting for stroke assessment within 4.5 hours of onset may be a useful radiographic sign of ipsilateral acute ischemic infarct.

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Feasibility of systemic thrombolysis of acute stroke patients during MR imaging
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Comparison of CT Perfusion and CT/NI-HSS Defined Mismatch
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Introduction Absence of major change on CT is required prior to thrombolysis in
stroke. CT perfusion (CTP) permits visualisation of core and penumbra and could help target therapy towards potentially salvageable “mismatch”. CT/NIHSS mismatch does not reliably predict MRI defined mismatch but differences exist between CT and MRI acquisition time which may limit the comparison. Agreement between CTP and CT/NIHSS mismatch has not previously been investigated.

Methods Patients presenting within 6 hrs of stroke onset had CT, CT angiography and CTP performed along with clinical assessment using the National Institute for Health Stroke Scale (NIHSS) as part of a prospectively recruited observational study. CT scans were evaluated using the Alberta Stroke Programme Early CT Score (ASPECTS). Mismatch between penumbra (Mean Transit time ≥ 145% of normal) and core (Cerebral Blood volume <2.0ml/100g) was measured using CTP with mismatch definition also requiring at least 10ml of penumbra. CT/NIHSS mismatch (NIHSS ≥8 with CT ASPECTS ≥8) was compared to CTP defined mismatch volume using a range of volumetric mismatch ratios (20-200%). Agreement between CT/NIHSS and CTP mismatch was assessed. Results 52 patients with hypo perfusion on CTP were assessed. Median NIHSS was 14 (IQR 8-19), mean age 71 years (SD 11). 48 arterial occlusions were present. CT/NIHSS mismatch was present in 20 patients (38%). CTP mismatch was present in 45, 39, 37, 36, 35 and 33 patients depending on mismatch ratio tested. Agreement between mismatch definitions occurred between 37% and 44% of cases depending on mismatch ratio. Kappa scores were <0.2 for all ratios tested.

Conclusion CT/NIHSS mismatch does not correlate with CTP mismatch using a range of volumetric mismatch definitions. CTP parameters reflecting core and penumbra detect mismatch more frequently than CT/NIHSS mismatch. Prospective evaluation of the impact of CTP defined core, penumbra and mismatch on patient selection for acute therapy is needed.

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Cystatin C, a Novel Indicator of Renal Function, Reflects Severity of Cerebral Microbleeds
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Background: Recent studies reported that chronic kidney disease (CKD) was associated with lacunar infarction, white matter lesions and microbleeds. Cystatin C, inhibitor of lysosomal cysteine protease, suggested to be a more accurate and sensitive indicator of kidney function, compared to creatinine or creatinine based estimated glomerular filtration rate (GFR). We investigated whether Cystatin C might reflect the severity of cerebral small disease.

Methods: Data collected on subjects with ischemic stroke to a university medical center was analyzed between January 2008 and May 2011. The severity of microbleeds was graded according to the number of microbleeds: normal, absence of MB, mild, 1-4, moderate, 5-9, severe, ≥10. Patients were
Should we use relative threshold values in CT perfusion for detection of early acute stroke?

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Background. Actual brain imaging require early detection of brain hypoperfusion in acute stroke. Computed tomography perfusion (CTP) method provide visual and quantitative values for differentiation of tissue viability before treatment, but previous published data are variable. The aim of study is to detect brain tissue viability grade on the basis of the CTP parameters in acute stroke patients, determine relative threshold values.

Methods. Multimodal CT imaging protocol (unenhanced CT, CT angiography, followed by CTP and 24 hours follow-up CT) was performed in 30 patients within 12 hours after onset. CTP data were analysed on three perfusion parameters: mean transit time (MTT), cerebral blood flow (CBF) and cerebral blood volume (CBV). Automated measurements were performed in affected and contralateral hemisphere, defining values for penumbra (potential reversible) and core (irreversible) lesions.

Results. Increased MTT was found in 94.1% cases, and at least 1.5 times increased to contralateral hemisphere in both lesions. CBF was considerably decreased (less than 30%) in 82.4% at core lesion, and above 40% from normal values in 72.2% at penumbra cases. CBV in penumbra lesion was decreased (above 60% from normal values (n=6)), normal (n=13) or increased (n=10). There was marked CBV decrease (below 40% from normal volume (n=10)) and highly significant correlation between CBF and CBV decrease in core (r=0.841; p<0.01) and decreased CBF (r=0.461; p<0.01) with variable CBV values in penumbra locations (r=0.240; p<0.05).

Conclusion. Most accurate parameter that confirms hypoperfusion is increased MTT. Proposed relative threshold values for necrosis: CBF less than 30-40% and CBV less than 40% compared with contralateral hemisphere. Penumbra lesion has increased...
Conclusion: We demonstrate feasibility of a novel EEG source localisation method in assessment of the ischemic penumbra.

Figure 1. The images are shown in neurological convention with the left side on the being left. The region of abnormal electrical activity on the LORETA images at 3.5 hours underestimate the perfusion deficit seen mean transit time (MTT) image in the temporal lobe and striatocapsular region. Follow up MRI FLAIR images at day 16 showed left striatocapsular infarct but none in the left fronto-temporal cortical region.

Figure 2. The full extent of abnormal electrical activity on the LORETA images at 3.5 hours.
CRYPTOGENIC STROKE AND PATENT FORAMEN OVALE: EPIDEMIOLOGICAL AND NEUROIMAGING CHARACTERISTICS OF A GREEK PATIENT GROUP
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Background: Paradoxical embolism through a patent foramen ovale (PFO) as a cause of stroke remains controversial. The aim of this study is to present epidemiological, clinical and neuroimaging characteristics of young patients with cryptogenic stroke and patent foramen ovale, referred to our department.

Methods: We retrospectively reviewed a total of 320 ischemic stroke patients aged 15 to 60, admitted to the Neurologic Ward of General Hospital of Piraeus during a period of 3 years (from 2008 to 2011). All patients underwent a thorough diagnostic work-up. Transesophageal echocardiography (TEE) was performed for the detection of PFO. Major risk factors such as hypertension, dyslipidaemia, smoking and less well documented risk factors such as migraine and thrombophilic disorders were assessed. SPSS statistical package was used to analyse the data.

Results: Seventy-eight patients (24%) had a cryptogenic stroke according to TOAST classification. In 20 of them (25%) TEE demonstrated the presence of PFO. This subgroup consisted of 11 females (55%) and 9 males (45%). Mean age was 43.4 years. The most frequent risk factors were smoking (45%), hypertension (15%) and dyslipidemia (15%). No patient was positive for antiphospholipid antibodies; 3 patients (15%) were factor V Leiden heterozygotes and 1 patient (5%) was prothrombin G20210A heterozygote. Concerning the neuroimaging characteristics, right hemisphere (45%) and multiple infarcts (30%) were more frequent in general. Stroke severity (according to NIHSS) was positively associated with patient age (Spearman’s Correlation Coefficient, r=0.67, p<0.01).

Conclusion: A thorough work-up is essential in young patients with stroke of undetermined etiology, including TEE for the detection of PFO. Major and less well documented risk factors were not frequent in our patient subgroup. Age was significantly associated with stroke severity.

Intracranial stenosis in sickle cell disease
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Background: Sickle cell disease (SCD) is an severe haematological disease. It is characterized by abnormal erythrocyte configuration with impact in microcirculation but also with reduction of arterial lumen reduction and intracranial vasculopathy, accessible to evaluation with transcranial doppler. The purpose of this work was to evaluate the prevalence of intracranial stenosis and stroke risk in a group of pediatric patients, which are followed in hematology outpatient clinic in two hospitals and transcranial doppler at our neurosonology lab.

Methods: Between January, 1, 2009 and November, 30, 2011, were evaluated 97 children and adolescents (< 18 years). It was used an Transcranial probe.Duplex equipment (Toshiba Xario) equiped with an 2 MHz probe. The hemodynamic parameters were used according to the STOP trial, which stratified stroke risk using the TAMMX (time-average mean of maximum velocity), in “low risk” < 170cm/s, “moderate “ 170 to 200 cm/s e “high” > 200cm/s. Patients were reevaluated at 12 or 3 to 6 months according to the results.

Results: 97 patients evaluated (57 males e 40 females) with ages from 2 to 18 years (average 10.07 years). Within the 3 yearsof follow-up, 6 patients were identified with high risk, 16 with moderate and 75 with low risk. The prevalence of intracranial stenosis was 23%. Of 6 patients with high stroke risk, 3 started regular transfusional regimen (and one had an revascularization surgery), 1 started hydroxiurea and 2 didn’t followed any therapy. In this group, 1 patient had an stroke, after interruption of transfusion therapy. In the moderate risk risk group, no patient had stroke and in the low risk, 1 patient started hydroxiurea and had strokes prior to the beginning of tjs folow-up and were in transfusion regimen.

Conclusion: The transcranial doppler follow-up allowed the optimization of transfusional therapy, with the goal of stroke incidence reduction in this population.

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Introduction: Relatively intact cognitive function was shown in a large part of oldest men. We aimed to study if survival bias affects a relationship between known risk factors as carotid stenosis and arterial leg disease, and a vascular cognitive decline.

Methods: A population sample of 478 men was examined at age 68, and 117 (24%) of them had uni/bilateral carotid stenosis ≥35%. Lowest tertile of Ankle-Brachial-Index (ABI) was ≤1.03 in left and ≤1.045
Etiology of stroke and risk factors

Ischemic Stroke Revealing Undifferentiated Connective Tissue Disease in Two young Women
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Introduction: Ischemic stroke is uncommon in young patient and its etiologies differ from older patients. Etiologic screening includes systemic diseases and hematologic disorder besides to the conventional causes of the old patients.

Case Report:
MA is a 23-year old woman, with a history of recurrent joint pain, presented with an acute left sided hemiplegy. MRI showed an ischemic stroke in the deep territory of the right middle cerebral artery. Investigation showed a high level of anti-nuclear antibodies (1/320). Other specific autoimmune antibodies were negative.

ZM is a 31-year old woman, with a history of recurrent cutaneous erythema and photosensitivity, presented with an acute right sided hemiplegy. MRI showed an ischemic stroke in the superficial territory of the middle cerebral artery. Investigation showed a high level of non specific antinuclear antibodies (1/160).

Discussion & Conclusion:
Among the causes of ischemic stroke in young patients, systemic diseases are more common in female rather in male. Our 2 young patients presented with ischemic stroke. Etiologic tests showed high level of non specific antinuclear antibodies.
Association between stroke risk factors, inflammatory markers and carotid plaque morphology
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Background. Unstable carotid plaque obtained by doppler duplex sonography is still a subject of scientific research. The aim of the study was to assess the correlation between traditional stroke risk factors, some inflammatory markers and carotid plaque morphology. Methods. 65 patients (20 females and 45 males) aged 55-80 years with ICA stenosis (>50%) where enrolled to the study. In all patients stroke risk factors were identified (age, sex, arterial hypertension, diabetes mellitus, dyslipidemia, atheromatosis in other vascular territories, smoking, family history of vascular diseases) and laboratory tests were performed (blood count, sedimentation rate, CRP, fibrinogen serum concentration, lipidogram). The extent and the morphology of the ICA stenosis were assessed with the Color Coded Duplex. We assumed high grade of stenosis (>80%), ulcerations on plaque surface and hypoechoic plaque structure as the features for carotid plaque instability. Results Ulcerations on plaque surface were more often in patients with low HDL-cholesterol (p=0,007) and hipertriglicerydemia (p=0,04) than in patients with normal lipid plasma concentrations. There were no statistical correlations between other traditional stroke risk factors and carotid plaque morphology. Mean WBC count, mean monocytes blood count and fibrinogen levels were significantly higher in patients with ulcerations on plaque surface than in patients without ulcerations (WBC: 8,75 G/l vs. 6,68 G/l; p=0,0003; monocytes: 0,72 G/l vs. 0,56 G/l; p=0,0135, fibrinogen: 3,89 g/l vs 3,36 g/l; p=0,0135). Mean WBC count was higher in patients with high-grade ICA stenosis (>80%) (7,72 G/l) than in patients with moderate ICA stenosis (6,74 G/l; p=0,0129). High CRP levels (>5 mg/l) were more often and mean WBC count was higher (7,8 G/L) in patients with hypoechoic plaque structure than in patients with hyperechoic plaque structure (6,51 G/l, p=0,0052; CRP: p=0,0005).
Conclusion Increased plasma inflammatory markers may be better indicator for unstable carotid plaque than the presence of traditional stroke risk factors.

Intracranial stenosis is the main cause of ischemic stroke in a prospective series of 159 young patients.
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The aim of our work was to describe etiologies and cerebrovascular imaging findings in young patients with ischemic stroke (IS). The study was based on a prospective cohort of 159 consecutive young patients (less than 45 years old), admitted in our department for an acute IS (confirmed by cerebral imaging) from October 2005 to December 2010. A systematic first-line screening was performed including blood tests, cardiovascular investigations and toxic urine analysis. If there was no etiology after these investigations, a second-line screening was performed with trans-femoral conventional angiography and cerebrospinal fluid analysis. In patients with intracranial stenosis, there was a control of neurovascular imaging planned within 3-6 months. Results: In this cohort of 159 IS, there were classical etiologies with cardioembolism in 21% (n=34), a cervical artery dissection in 15% (n=23), an extracranial atherosclerosis stenosis in 4% (n=7), a small-vessel occlusion in (n=1). There were more rare causes in 5% including hematology etiology (n=5), vascularitis (n=2), migrainous stroke (n=1). In 8% (n=12) exhaustive investigations only showed a patent foramen ovale and or atrial septal aneurism. The most frequent cause of IS was intracranial stenosis in 35% (n=55), which were monofocal (n=28), or multifocal (n=27). There was no etiology in 12% (n=19). In this series, there were 29 cannabis abusers (18%), and 18 out of them had reversible intracranial multifocal stenosis. Conclusion: This study confirmed that exhaustive investigations are necessary in young patients with IS and that intracranial stenosis are frequent in one third of patients justifying exhaustive cerebral vascular imaging. Taking a history of drug abuse (especially for cannabis), as well as urine analysis for toxic substances should be part of the evaluation of young patients with IS.
Background and objective: Transesophageal echocardiography (TEE) is an established tool for assessing embolic sources to the brain. Although the left atrial appendage (LAA) volume of stroke patients often enlarged, it was not evident whether the LAA volume enlargement is associated with stroke mechanism. This study aimed to elucidate whether the LAA volume measured by 3D-TEE is associated to stroke patients with atrial fibrillation (AF).

Methods: We performed 3D-TEE using an iE 33 Ultrasound Machine in arbitrary selected acute stroke patients. The LAA volume was corrected with the area of body surface. We divided patients into three groups: patients with AF at the examination (A group), those with sinus rhythm at the examination and a history or later documentation of paroxysmal AF (PAF) (B group) and the others (C group). Results: A total of 106 acute stroke patients (28 women, 73.5±10.4 years) were registered. Of these, 26 patients belonged to the A group, 17 belonged to the B group, and 63 belonged to the C group. LAA volume was negatively correlated with LAA peak flow velocity (FV) (r = -0.493, p <0.0001). Median LAA volume was 7.84ml/m2 (IQR 2.27-21.7) in the A group, 4.60ml/m2 (1.62-9.08) in the B group, and 2.84ml/m2 (0.68-7.32) in the C group (p <0.001). Median FV was 21cm/s (10-83), 39cm/s (11-82) and 66cm/s (22-149), respectively (p <0.001). Using ROC curve analysis, the optimal cutoff of the LAA volume to predict patients with any AF (both Groups A and B) was ≥4.46ml/m2, with a sensitivity of 73.8%, specificity of 81.0% and an area under the ROC curve of 0.808: the cutoff was independently associated with any AF after adjusting for sex, age, hypertension, diabetes mellitus, and chronic heart failure (OR 9.80, 95% CI 3.76-27.84, p <0.0001). Similarly, FV <44cm/s was associated with any AF (OR 9.74, 95% CI, 3.55-27.93, p<0.001).

Conclusions: Large LAA volume measured using 3D technique seems to be an independent predictor of atrial fibrillation.

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CAN WE EXPECT NEW ERA IN UNDERSTANDING MECHANISMS OF ATHEROSCLEROSIS AND ITS MAJOR COMPLICATIONS? LP-PLA2 - New Specific Vascular Inflammatory Enzyme Starts New Approach in CEA and CAS

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Introduction
Inflammation plays an important role in atherosclerosis. New vascular-specific inflammatory enzyme (LP-PLA2) increases the risk of stroke and may represent an important role in its prognosis and in peri/postprocedural CEA/CAS complications.

Aim
To analyze LP-PLA2, IMT, and plaque morphology in 1. arterial hypertension (AH), 2. ischemic cerebral stroke (iCI), 3. coronary artery disease (CAD), 4. post-CEA pts, and controls (C). Prospective multicenter multidisciplinary study.

Material, Methods
566 subjects. 1. C (n=102), mean age 47.5 +/- 18.5, men 53.7%, without history of major CV RFs. 2. AH (n=117), mean age 60.0 +/- 11.2, men 48.3%, 3. CAD (n=95), mean age 70.8 +/- 1.8, men 51.5%, 4. iCI (n=102), mean age 73.4 +/- 9.9, men 54.2%, 5. post-CEA pts (n=150), mean age 57.2 +/- 8.7, men 59% NIHS, BI, mRS, LP-PLA2 (Dia Dexus Inc., USA), lipids, Fbg, Troponine, Hcy, other bio- hematological parameters, CT/MRI (ischemic volume), Stiffness, IMT (Sphyngocor, AtCor Sydney, USG), simult. long-term ECG/BP monitoring, Pearson-Spearman-Kandell, Student, Whitney U tests.

Results
LP-PLA2: 1. AH vs controls 219.01 +/- 27.64, vs 183.27 +/- 25.2, p=0.001, 2. CAD vs C 234.02 +/- 51.58, p=0.0002, 3. iCI vs C 259.2 +/- 86.2, p=.0001, 4. iCI vs CAD no significant. Dyslipidemia: Close correlation between Tchol and LDL, but no significant correlation between LP-PLA2 and Tchol, LDL. Stiffness/IMT: significantly higher aortic PWV, Alx, and IMT in iCI compared to controls. No significance between iCI and CAD and between IMT and complication rate in PostCEA pts. Significant correlation between plaque morphology, LP-PLA2, and complication rate.

Conclusions
Study showed 1. significant higher values of LP-PLA2, stiffness, IMT, and plaque morphology not only in iCI/CAD but also in AH comparing to controls, 2. no statistical correlations between lipids and LP-PLA2, 3. significant correlations between LP-PLA2, IMT, plaque ulcer and post-CEA rate complications, 4. LP-PLA2 is a key inflammatory marker, specifically linked to plaque inflammation and plaque rupture.

Supp. by Intern. grants ITMS26220220099, ITMS26220220153

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Ischemic stroke in patient with secondary polycythemia due to renal dysplasia
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Background:
Ischemic stroke in young patients implies an etiological exhaustive investigation and results many times from uncommon causes. Hematological disorders that lead to hyperviscosity syndrome and, consequently, to a thrombotic state, contribute to the risk of cerebral ischemic events, and can cause strokes in the absence of other risk factors. We report the case of an ischemic stroke in a young patient with polycythemia.

Case report:
A 46-year-old healthy man from Timor, without vascular risk factors, was admitted to our hospital with headaches, dizziness and vomiting, for two days. Since the previous day he noted loss of power on the left side. Neurological examination: left hemi-extinction on bilateral simultaneous stimulation, left homonymous hemianopsia, left hemiparesis (grade 3 MRC). Cerebral MRI/MR angiography showed temporal-occipital right infarct with a “stop” signal in the right PCA. Vascular workup was negative, except for elevated hemoglobin and hematocrit (Hb 19,6g/dL; Ht 55,9%). Polycythemia investigation showed: no hypoxemia; normal erythropoietin; negative JAK2 gene mutation; multicystic dysplastic changes in the left kidney were found on ultrasound and CT scan. Aspirin and phlebotomy therapy were started to control polycythemia and prevent new ischemic events. A left nephrectomy was proposed.

Discussion:
Patients with polycythemia can be asymptomatic or show symptoms related to hyperviscosity and thrombosis, presenting occasionally with an ischemic stroke. Having detected polycythemia and facing the normality of the rest of the investigation, etiology of the ischemic stroke was attributed to that hematology change. Due to the presence of a renal cause and excluding Polycythemia Vera (95% of the cases are JAK2 positive) we concluded that this is secondary polycythemia due to renal dysplasia.

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Intracranial stenosis according to different clinical lacunar stroke syndromes
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Background: Lacunar infarction represents a clinical and imagiologically defined cerebrovascular syndrome of heterogeneous etiology. Recent attention has been drawn to its possible association with intracranial atheromatosis and a correlation has been established between the volume of lesion and intracranial stenosis. We aimed to clarify whether different clinically defined lacunar syndromes might have a preferential association with intracranial stenosis.

Methods: All consecutive patients undergoing cerebrovascular ultrasonographic evaluation during 2011 with imaging confirmed lacunar stroke were included. The only exclusion criteria was the absence of transtemporal insonation window. Patients were classified according to the Oxfordshire Community Stroke Project in pure motor syndrome (PM), pure sensitive (PS), sensitive-motor (SM), ataxic hemiparesis (AH) or clumsy hand dysarthria (CHD). Symptomatic intracranial stenosis was determined by the presence of focal stenosis in an intracranial artery directly tributary to the area of infarction by clinical and imagiological definition. Vascular risk factors were registered from clinical files. Statistical significance was set for p<0.05.

Results: We identified 151 patients with lacunar strokes and 17 (11.3%) were excluded due to absent insonation window. Mean age was 66.3 years (SD:13.1) and 97 (72.4%) were male. We registered 74 (55.2%) PM, 15 (11.2%) PS, 23 (17.2%) SM, 18 (13.4%) AH and 5 (3.0%) DCH. The prevalence of vascular risk factors was similar across lacunar syndromes. Symptomatic intracranial stenosis was found in 11.9% (n=16), and it was more common in SM syndromes (30.4%, n=7) than PM (6.8%, n=5), PS (6.7%, n=1), AH (16.7%, n=3) or DCH (0%, n=0), p=0.03.

Conclusion: Our data suggests that the possible association between lacunar infarction and intracranial atheromatosis is not uniform within clinical lacunar syndromes and may be preferential for sensitive-motor syndromes.

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IgM Seropositivity as a Marker of Recent Clinical and Subclinical Common Infections Activation Correlates with Ischemic Stroke Severity


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Background. Not all recent studies confirm an association of ischemic stroke (IS) risk with aggregative burden of common viral and bacterial infections.

Methods. Cytomegalovirus (CMV), herpes simplex virus (HSV), varicella zoster virus, Helicobacter pylori, Mycoplasma pneumoniae, Chlamydia pneumoniae immune-
globulins (Ig) M were determined in 199 IS patients and 54 healthy controls using an enzyme-linked immunosorbent assay. The relevant infectious agents DNA was examined in the internal carotid arteries (ICA) specimens of 24 IS patients at autopsy and in those of 34 patients with asymptomatic carotid stenosis after carotid endarterectomy using the PCR technique. The serum levels of separate inflammation and dyslipidemia markers were also determined.

Results. The total rate of infectious pathogen IgM in IS patients was significantly higher than in the controls, respectively 98 of 199 - 49,2% and 5 of 54 - 9,3%, p<0,0001. IgM antibodies were detected more frequently in the patients with recent infections (19 of 26 – 73,1%) compared to the patients without them (79 of 173 – 45,7%), p= 0,02. The total rate of infectious agents DNA in the ICA specimens of fatal IS patients was higher than in asymptomatic carotid stenosis, respectively 12 of 24 - 50,0% and 7 of 34 (20,6%), p= 0,04. The total number of detected IgM correlated with the baseline stroke severity assessed by scores in the Scandinavian Stroke Scale (Sperman rank - R= -0,33, p= 0,03). The HSV IgM seropositivity was found to correlate with lower functional recovery in the IS patients according to the data evaluated by the NIHSS (R= 0,40, p=0,02) and the Barthel Index (R=-0,26, p=0,04). The total IgM seropositivity moderately correlated with blood pressure (R=0,57, p=0,004), D-dimers (R= 0,26, p= 0,03), IL-6 (R=0,60, p=0,005), CD4+/CD 40L+(R=0,53,p=0,04) levels.

Conclusions. The findings given are suggested to be considered in ischemic stroke phenotyping and personalization of stroke prevention and treatment.

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CRITICAL INFLUENCE OF PREVIOUS ALCOHOL CONSUMPTION ON ISCHEMIC STROKE AND THROMBOLYSIS
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Background: while alcohol consumption is a known risk factor for stroke, its impact on the progression of ischemic lesions remains barely investigated. Besides, the effects of alcohol consumption on thrombolysis (by recombinant tissue plasminogen activator, tPA) have not been studied to date.

Methods: here, we have evaluated the influence of different patterns [uninterrupted or intermittent] of chronic alcohol consumption (p.o., alcohol 10% diluted in drinking water during 6 weeks) on (i) the progression of brain lesions after stroke, and (ii) thrombolysis. Mice were subjected to thrombotic ischemia by direct injection of thrombin into the middle cerebral artery. After 20 min, some mice were thrombolysed (i.v. tPA), and others were injected with saline.

Results: Alcohol-exposed mice (both uninterrupted and intermittent exposures) showed higher final lesion volumes than control animals (+78% and +44% respectively; p<0.05). As expected, thrombolysis reduced final lesion volumes in control animals (-65% versus control-saline mice; p<0.05), but it lost its beneficial effect after
both types of alcohol consumption. We detected changes in several coagulation factors (prothrombin ratio, factor V, factor VIII and platelet number) in alcohol-exposed mice, suggesting liver damages. We observed no changes in endogenous tPA levels or in the capacity to form/dissolve clots after alcohol exposure. Alcoholised mice had decreased hepatic levels of low-density lipoprotein receptor-related protein and the inhibitor of tPA, PAI-1 (both involved in tPA clearance). We hypothesize that alcohol-induced defects in the liver clearance of tPA increase its plasmatic half-life and its attendant deleterious effects in the brain.

Conclusion: alcohol consumption increases the progression and final extent of ischemic lesions, and impairs thrombolysis. Alcohol misusers may thus represent specific sub-populations of stroke patients, for whom acute treatment must be adjusted accordingly.

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Risk factors of stroke patients admitted to a general hospital in Kuwait
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Background: There is limited data of stroke incidence in the Middle East. The only one from Kuwait showed annual crude incidence rate to be 27.6/100,000 population. This study is to establish a baseline status in Kuwait. Method: This is a retrospective chart review of all patients admitted to Amiri Hospital, Kuwait, and either discharged or passed away with a diagnosis of stroke, intracerebral hemorrhage, or hemorrhagic transformation of ischemic stroke in the period from January 1st to December 31st, 2008. Stroke was defined according to the World Health Organization (WHO) definition. Inclusion criteria included patients aged 12 years and older with no alternate diagnosis for their presentation. Documented risk factors for stroke were analysed for the total cohort and for male and female groups. Stroke subtypes were in accordance to the TOAST criteria. Stroke risk factors that were analysed were: Hypertension, diabetes mellitus, hyperlipidemia, smoking, atrial fibrillation, and ischemic heart disease. Results: There were 151 cases of stroke, of which 90.1% were ischemic. 63.6% were men. The mean age of patients was 60.5 years. The mean age was 63.8 and 58.3 years for women and men. Kuwaiti nationals were 51.7% of the total cohort. 17.9% were documented as current smokers. 56.3% of patients had diabetes mellitus, 57% had hyperlipidemia, and 68.9% had hypertension. Statins were used by 42.4% of the 86 hyperlipidemic patients prior to their presentation. 63.5% of patients were on treatment for hypertension prior to their presentation. 4% of patients had atrial fibrillation diagnosed prior to their presentation, and 4% more were diagnosed afterwards. History of ischemic heart disease was present in 28.5% of subjects. The majority of the stroke mechanisms were related to microangiopathy (37.7%). The least were Cardio-embolic in origin (7.9%). Conclusion: This study shows similar rates of risk factors to regionally published reports.
Background and aim. Stroke is one of the main causes of mortality and disability around the world. However, information on the main determinants of long-term stroke incidence in stable outpatients at high risk in Latin America is sparse. This represents an important barrier to effectively approach this problem in this part of the world. We aimed to describe the factors associated with new and recurrent acute ischemic stroke (AIS) in the Latin American cohort of the Reduction of Atherothrombosis for Continued Health (REACH) registry.

Methods. We analyzed 1816 Latin American outpatients (mean age 67 years) with established symptomatic atherothrombosis [87.1%: coronary artery disease (CAD), cerebrovascular disease (CVD) or peripheral artery disease (PAD)] or with multiple risk factors only (12.9%). Multivariate analyses were modeled to find independent predictors of new or recurrent AIS at 4-year follow-up.

Results. Four-year fatal or non-fatal AIS occurred in 89 (4.9%) patients (2.6% in asymptomatics with multiple risk factors, and 5.2% in patients with established vascular disease, P=0.08). Recurrences were more frequent than new stroke cases in patients with established atherothrombosis, so that AIS occurred more frequently in patients with established CVD (10.3%) than among asymptomatics.
Ischemic stroke is still a health issue. Its incidence in the working age population is high. Even after exhaustive explorations, etiologies remain undetermined in about a third of patients aged under 55, making secondary prevention inaccurate. Illegal drug use could be responsible for a great part of these ischemic strokes.

The aim of our study was to determine the prevalence of illegal drug use among an ischemic stroke population of adults aged under 55 and to determine their demographic and clinical characteristics. We carried out a 2 year monocentric study in the Grenoble University Hospital neurology department from December 1st 2008 to December 1st 2010. We included 159 consecutive ischemic stroke patients hospitalized in our department who had undergone a urinary toxicological screening for amphetamines, opiates, cannabinoids and cocaine, or admitted using illegal drugs less than 24 hours before stroke occurrence.

Our population was 43.0 years old on average, and 12% had a positive urinary test. The first drug used is cannabis in 11.3% of all patients and 25.6% of 18 to 35 year old patients, who all smoked tobacco. Cocaine was the second illegal drug used, for two tobacco and cannabis smoker patients, aged less than 35 years. Eight patients were tested positive for opiates but half of them due to a therapeutic use. No patient used amphetamines. It seems that the prevalence of illegal drug users is more important among individuals with PAD (5.6%) or CAD (3.1%) at baseline (P<0.001). In a Cox proportional hazards model on baseline factors associated with new or recurrent AIS during the 4-year follow-up, CVD [hazard ratio (HR): 3.75, 95% confidence interval (CI): 2.35–5.97], and age >60 years (HR: 1.99, 95% CI: 1.08–3.68) were significant predictors, whereas continued statin (HR: 0.62, 95% CI: 0.40–0.95) and aspirin use (HR: 0.62, 95% CI: 0.40–0.97) were associated with a reduced risk.

Conclusion. Recurrent AIS is more common than a new event in stable Latin American outpatients with atherothrombosis. As expected, advanced age is a determining factor for incident or recurrent AIS. These findings evidence the role of an established vasculopathy in the risk of future ischemic events in the same vascular bed. Our results also emphasize the need for an effective and continued pharmacological prevention.

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Ischemic strokes in young adults and illegal drug use, a local French study
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Background
Vascular dysfunction may be involved in migraine pathophysiology and contribute to the increased risk of ischemic stroke in migraine, particularly in women with migraine with aura (MA). However, data on endothelial function in MA are controversial. Here, we investigated whether systemic endothelial function and arterial stiffness are altered in women with MA using peripheral arterial tonometry.

Methods
Twenty-nine female MA patients without comorbidities and 30 healthy women were included and carotid intima-media thickness (CIMT) was assessed by a standardized procedure. Endothelial function was assessed using peripheral arterial tonometry (PAT). Reactive hyperemic response of digital pulse amplitude was measured following 5 minutes of forearm occlusion of the brachial artery. Arterial stiffness (AS) was assessed by fingertip tonometry derived and heart rate adjusted augmentation index (AI).

Results
No differences were found for PAT-ratio (2.3 ±0.6 vs 2.2 ±0.8; p=0.58) and CIMT (left IMT in µm: 484 ±119 vs 508 ±60; p=0.37). Women with MA had higher heart rate (HR) averaged AI [median (interquartile range) of 5 (IQR 0.5-18) vs -5 (IQR -16.8-8.3), p=0.005] and HR adjusted AI [1 (IQR -6-12.5) vs -8 (IQR -20.3-2.5), p=0.008] than healthy controls.

Conclusion
Peripheral endothelial function is not impaired in women with MA, but increased AS is present. This may contribute to the increased stroke risk in women with mi-
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Risk factors, Clinical Presentation and outcome of Stroke in Mukalla, Hadhramout, Yemen: Case-Control Study
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Background: Stroke is the third leading cause of death, and a major cause of long-term disability among survivors. Our country is lacking studies about stroke.

Patients and Methods: a retrospective study of stroke patients admitted in Ibnseena Hospital at Mukalla Hadhramout during the period January 2009-December 2010. Data were collected in a questionnaire from the patients’ medical files.

Results: there were 774 stroke cases during the study period with age mean of (69 +/- 13.3) years +/- standard deviation; ischemic stroke represented 82.9% and the hemorrhagic type 17.1%. Males were 55.8%. Hypertension was the most common risk factor (57.2%) of cases, followed by diabetes mellitus (44.8%), smoking (20.9%) family history (13.4%), previous attack (10.6%) and dyslipidemia (8.7%). In 4.7% of cases there was no risk factors, 24.5% with one and 70.8% were with two risk factors or more. About 75% sake hospital within 24 hours, 90.4% with sudden onset, 61.4% were fully conscious and 38.6% with disturbed consciousness. Dysphasia were in 31.8%. In-hospital death was 33.6% of cases.

Conclusions: Males were slightly higher than females. Hypertension, diabetes mellitus and smoking were the most common risk factors, while dyslipidemia the least. About one third of cases died in hospital.

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Migraine is very rare in Korean patients with CADASIL
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Background and aims- In Caucasians, migraine is the most common initial symptom in patients with cerebral autosomal dominant arteriopathy with subcortical infarcts and leukoencephalopathy (CADASIL). However, the patients with CADASIL from Asia including those from Korea, Japan, and China, showed a lower prevalence of migraine. The exact cause of such difference is still unknown. The purposes of this study are thus to determine the prevalence and clinical characteristics of headache in our patients with CADASIL.

Methods- The subjects in this study consisted of 62 consecutive Korean patients older than 18 years who had been diagnosed as CADASIL between November 2010 and April 2011. All patients received a clinical examination and cranial MRI. Headache was diagnosed and classified according to criteria of the International of Headache Society.

Results- The prevalence of headache was 43.8% (28 patients) and the mean age of
onset of headache was 47.4±13.5 years (ranged from 10 to 79 years). The most frequent type of headache was infrequent or frequent episodic tension-type headache (19 patients) and followed by probable migraine (3 patients) and chronic tension-type headache (1 patients). There were no differences in clinical phenotypes and vascular risk factors between the patients with and without headache. Conclusions-The prevalence of migraine was very low in our patients with CADASIL. The most frequent type of headache was tension-type headache. Other clinical features and vascular risk factors did not differ between patients with and without headache.

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Stroke in the young: report of over ten years Stroke Unit experience
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Background: Pathogenesis and risk factors of stroke in the young are still not clearly identified. A considerable part of ischemic stroke is classified as cryptogenic, and secondary prevention is managed on the basis of few evidence. This is a daily problem not only for clinicians but also for patients who have to cope with uncertainty for the future. The aim of our study was to describe the pathogenesis of ischemic stroke (IS) in a in-hospital population series of young patients.

Methods: records of consecutive patients < 50 years of age admitted to the Stroke Unit of Careggi Hospital (Florence, Italy) and discharged with diagnosis of stroke from 2000 to 2011 were reviewed focusing on pathogenesis and risk factors of ischemic stroke (IS).

Results: 193 records were included. Patients mean age was 38.8+-8.3 years, 54% were males. Fourteen patients (7%) had haemorrhagic stroke, nineteen (10%) had cerebral vein thrombosis, and 160 patients (83%) had IS. Thrombolytic treatment was performed in 30 out of 132 patients admitted after 2004 (23%). Smoking was the most frequent (60%) risk factor for IS, followed by alcohol use (25%), dyslipidemia (25%), hypertension (24%), high body mass index (13%), and drug abuse (8%). Pathogenesis of IS according to TOAST criteria resulted as following: 3% large vessels disease, 9% cardioembolic, 4% small vessels disease, 38% other causes (65% dissections), 46% cryptogenic. In this last group 34% had patent foramen ovale (PFO), and 44% were using estrogens-progesterinics. Among cryptogenic stroke patients with PFO, one out of 29 patients had deep venous thrombosis and three had interatrial septal aneurysm.

Conclusions: despite extensive investigations, stroke of unknown origin is the most frequent. Our results outline the need to reduce the high percentage of cryptogenic stroke in young patients in order better target secondary prevention strategies.

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Stroke risk factors in a homogenous pop-
BACKGROUND: Although progress in the therapy of acute stroke has been achieved, prevention still remains of major importance as the incidence of stroke is expected to increase in the next 20 years due to the ageing population. In addition, there are few studies on the incidence of stroke in young adults in Greece. METHODS: We studied the main risk factors of the patients who admitted to the Department of Neurology of the University Hospital of Ioannina from May 2010 to May 2011 with the clinical diagnosis of stroke or transient ischemic attack, in a genetically homogenous population from Epirus, Greece. All the subjects were ≤ 65 years old (18-45). RESULTS: A total of 110 patients which fulfilled the above criteria were admitted during this period. Their mean age was 61.8 years. The common identifiable risk factors for stroke or TIA were hypertension (63.6%), hyperlipidemia (62.7%), smoking (53.6%), and previous history of a cardiovascular event (46.3%), diabetes mellitus (28.2%), atrial fibrillation (17.3%) and positive family history for stroke, angina or myocardial infarct (15.5%). A 74% of the patients had ≥2 and almost 35% ≥3 risk factors. CONCLUSION: Etiology of ischemic stroke in young adults is diverse and demands thorough diagnostic evaluation. In this homogenous population, etiology and risk factors start resembling those seen in the elderly. The frequency of ischemic stroke increases sharply at age of 40. The genetic background, the environmental conditions and the dietary and other habits in this population are issues for further study.

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**Smoking cessation program in a stroke unit**

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Background:
The tobacco use is a major independent risk factor for recurrent stroke. Unfortunately, most of stroke patients identified as smoker at the time of their event continued smoking after.

Being hospitalized in a stroke unit impose to patients that they stop smoking and should help to introduce this important treatment target.

Methods:
We elaborate a systematic protocol for patients who smoke, starting the first day of their admission in the stroke unit, that consists in:
- identification of smoking habits and dependency
- treatment with nicotine replacement therapy
- strong well defined messages by the stroke unit’s neurologists and nurses about the importance of quitting
- consultations with a tobacco cessation nurse specialist

Results:
From June 2010 to June 2011, 152 patients (19.1%) entered in this protocol (mean age 54.1 years, 67% male). 61.2% had an ischaemic stroke, 17.5% a TIA and 7.8% a brain hemorrhage.

Satisfaction rate of patients was very high (98%)
Smoking abstinence rate was 19.4% at 3 months, which can be considered has a good result, regarding the rate obtained in the nicotine replacement therapy studies (from 12.5 to 18%)

Conclusion:
Taking care of smoker patients with a systematic protocol and nicotine replacement therapy significantly enhance the smoking abstinence rate.
This important target of the secondary prevention treatment should be given as much important as the others risk factors.

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**Stroke types, subtypes, etiology and risk factors- A registry from North India tertiary care university hospital**
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Introduction: Classifying stroke types and subtypes is helpful for adequate treatment, secondary prevention and clinical outcome. To find out etiology and risk factors in each stroke type is equally important. We report on stroke registry of 1126 subjects from North India.

Methods: Hospital based prospective registry of 1126 consecutive subjects with stroke was analysed. Detailed medical history, stroke presentation, clinical examination, course, outcome, and laboratory and neuroimaging results were captured on a structured stroke proforma. History of vascular risk factors and conditions associated with atherosclerosis and stroke were determined in each patient. All patients had CT and/or MRI and MRA, carotid Doppler and echocardiography. Other specific investigations were performed as and when required. Demographic details, clinical profile, stroke types and subtypes, risk factors, and etiology were analysed.

Results: A total 1126 subjects with stroke 815 (72.38%) were males with mean age of 53 years (±13.4 years). Three hundred thirty (29.5%) subjects were young (age less than 45 years). Nine hundred fifteen (81.3%) had ischemic and rest hemorrhagic stroke. Atherothrombotic stroke was most common (54.2%) followed by lacunar (10.5%) and cardioembolic stroke (9.4%). Out of 106 subjects with cardioembolic stroke 22(20.8%) had atrial fibrillation. Twelve subjects had venous stroke and another 12 vasculitis. Hypertension was found to be the most common risk factor 698/1126 (59%) followed by diabetes, hyperlipidemia and smoking in 30%, 29% and 24% respectively.

Conclusion: Adequate public awareness and prevention of modifiable risk factors can help to reduce the burden of stroke.

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**Predictors of cause-specific mortality after stroke in the Copenhagen Stroke**
Ischemic heart disease (HR 1.70) indicated death by heart/arterial disease. Atrial fibrillation (AF) (HR 1.43-1.80) indicated death by cardiovascular disease (stroke and heart/arterial disease). Hypertension, smoking and alcohol consumption were not associated with cause-specific death.

Conclusion: Previous stroke and hemorrhagic stroke associates with death by stroke, ischemic heart disease with death by heart/arterial disease while AF associates with cardiovascular death (stroke and heart/arterial disease). Age, sex, stroke severity, diabetes, hypertension, smoking and alcohol consumption had no value in predicting cause of death following stroke.

PROGNOSTIC VALUE OF OXIDATIVE STRESS MARKERS IN PATIENTS WITH ISCHEMIC STROKE

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Background: The role of free radicals is...
gaining, increasing worldwide attention, since so many physiological and pathophysiological phenomena are related to redox status cell modification. It is becoming increasingly clear that oxidative stress and excessive inflammatory response are implicated in the pathogenesis of ischemic and reperfusion injury to many organs, including the brain.

Objective: To assess the hypothesis that oxidative stress status is associated with stroke outcome and to point out the few conditions for a favorable rehabilitation of the affected patients.

Methods: Prospective study including 55 patients with acute ischemic stroke, in whom initial and 2- months’ levels of serum oxidative stress markers - albumin, uric acid, copper and total antioxidant status (TAS) - were correlated with 2-months’ functional and 12-months’ vascular stroke outcomes. Poor functional outcome was defined as a NIHSS score exceeding 3 and vascular outcome was defined as a composite of recurrent stroke or vascular death during the study period.

Results: Patients with poor functional outcome presented initial no significant lower levels of uric acid and TAS and significant lower uric acid variations (p<0.01) between the two determinations. We detected lower levels of albumin and TAS in patients who presented vascular death during the evaluated period.

Conclusions: Some of the oxidative stress markers, as uric acid, albumin or TAS could have a prognostic value related to the functional or vascular outcome in ischemic stroke patients.
Results - Taking the first event as the index case, recurrent 90 day stroke risk was 24.6% in patients with VB stenosis (>50%), compared to 7.2% in those without (OR = 4.2; 95% C.I.= 2.1-8.6; P < 0.0001). Risk was higher with intracranial stenosis 33.3% (OR = 6.5; 2.8-15.0; P < 0.0001), and lower (16.2%) in extracranial stenosis (OR = 2.5; 0.9-6.8; P = 0.06). Taking the presenting episode as the index event the risk was 9.6% in patients with stenosis versus 2.8% in those without (OR = 3.7; 1.2-11.0; P=0.012), and again the risk was higher with intracranial stenosis. Cox regression showed the risk associated with VB stenosis is independent of other cardiovascular risk factors.

Interpretation – Symptomatic VB stenosis is an strong independent predictor of stroke recurrence. Intracranial stenosis confers a higher risk. The high early recurrent risk provides a strong rationale for randomised trials to determine whether stenting can reduce risk.

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LEPTIN, ADIPONECTIN AND GHRELIN, NEW POTENTIAL MEDIATORS OF ISCHEMIC STROKE

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Introduction: Fat tissue is an important endocrine organ that produces a number of hormones and cytokines (leptin, adiponectin, resistin, plasminogen activator inhibitor - 1, tumour necrosis factor TNF α) with essential roles in regulation of many physiological functions. Methods: We targeted implications of adipocytokines in ischemic stroke patients. Patients with acute stroke were examined (n = 145) and the results were compared with the control group (n = 68). We have examined potential associations between leptin, adiponectin and ghrelin, and different types of stroke and traditional risk factors.

Results: Significantly higher levels of leptin and lower levels of adiponectin and ghrelin were confirmed in the stroke group. The level of leptin in women with stroke was three-times higher than in men, and the leptin levels positively correlated with obesity in both sexes. Ghrelin levels correlated mildly with triglyceride levels, and were dominant in men with cardioembolic stroke. Adiponectin levels were not different between men and women with acute stroke, and correlated with atherothrombotic and lacunar stroke types in men.
Conclusions: Adipocytokines and ghrelin play an important role in ischemic stroke, but their function in stroke subtypes seems to be different and sex influenced.

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Adverse outcome in patients with acute ischemic stroke and low ejection fraction: systolic ventricular dysfunction is not to blame.
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Background and objectives: Systolic ventricular dysfunction increases the risk for ischemic stroke 2-3 fold. It is documented by decreased left ventricular ejection fraction (EF). The aim of this study was to assess the clinical characteristics and predictors of early and long-term outcome in patients with EF ≤ 35% in a large consecutive series of AIS. Methods and results: All patients registered between 2003 and 6/2011 in the Acute Stroke Registry and Analysis of Lausanne (ASTRAL) were selected. Demographics, risk factors, pre-stroke treatment, and clinical, radiological and metabolic variables in patients with and without low EF were compared. In-hospital death, 12-month mortality and disability were assessed in patients admitted up to 6/2010. Among 2439 AIS, 119 (4.9%) had EF ≤ 35%. Patients with low EF were more commonly men, of older age, had higher rates of coronary artery disease (CAD) and atrial fibrillation, and more frequent pre-treatment with anticoagulants, antiplatelets and antihypertensive agents. On admission, they presented with higher stroke severity, more frequent paresis and visual field defects. They also had lower values of systolic blood pressure, higher heart rate, and worse estimated glomerular filtration rate (p<0.05 for all comparisons). Radiological and other metabolic variables were not different. Cardioembolism was the major mechanism of stroke in low EF patients, followed by multiple causes. Although low EF patients had higher in-hospital (19.5% vs. 7.8%) and 12 months death rates (32.8% vs. 16.5%), these differences were not explained by low EF after adjustment by other factors such as age, baseline NIHSS and heart rate, pre-stroke anticoagulation, and documented CAD. Similarly, the higher rate of unfavorable outcome was explained by other factors than low EF. Conclusions: AIS in patients with low EF is associated with higher age, cardiac comorbidities, and more severe clinical presentation. Seemingly increased short and long-term disability and mortality in such patients are, however, better explained by age, stroke severity, and cardiovascular comorbidities than by low EF.

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Pulsatillity Index by transcranial doppler in acute ischemic stroke and TIA patients
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Background: Focal adherent thrombi in the common carotid artery without demonstrable atheroma on Duplex scanning or angiography are odd, seem rare but may be misdiagnosed. Their aetiology is still being discussed. Our aim was to better define their cause.

Material and methods: a multicenter retrospective study has collected 11 cases of thrombi in those arteries. Thrombi associated with an atheromatous stenosis or due to a cervical artery dissection were not included. Eleven patients (4 men and 7 women), aged 49 +/- 11 years were hospitalized for ischemic strokes (N: 9) and for TIAs (N: 2). All the patients underwent a Duplex scanning, some of them also underwent intraarterial angiography (N: 5) and/or magnetic angiography (N: 5). Six patients had their thrombus surgically removed.

Results and Discussion: Higher peripheral vascular resistance as determined by PI in patients with acute ischemic stroke or TIA is found in older patients, patients with diabetes and PVD.

WHAT SHOULD WE THINK OF AN ISOLATED FOCAL THROMBUS IN THE COMMON CAROTID ARTERY

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Background. Pulsatility Index (PI) reflects peripheral vascular resistance of the brain vessels. Limited information exists in the literature about possible determinants of PI in patients with acute ischemic stroke and TIA.

Patients and methods. We used TCD for determining of PI in middle cerebral artery (MCA) on both sides in 988 (699 males) patients with acute ischemic stroke or TIA in the carotid territory hospitalized in the department of Neurology, Rambam Health Care Campus, from 2001 till 2008.

Results. Mean PIs in the MCA on the side of ischemia and unaffected side were similar (0.95 vs 0.98). We did not found difference in mean PI in patients with stenosed (50% and more) or occluded internal carotid artery (ICA) as compared with patients without occlusive disease of ICA (0.94 vs 0.97). After logistic regression analyses age, diabetes and peripheral vascular disease (PVD) were found to be independent determinants of higher PI in the patients with acute ischemic stroke or TIA.

Conclusions. Higher peripheral vascular resistance as determined by PI in patients with acute ischemic stroke or TIA is found in older patients, patients with diabetes and PVD.
an iron deficiency in 3 cases (the platelet count was from 560000 to 687000/mm3) and a circulating lupus anticoagulant in 1 further case. The white coloured thrombus noticed by the surgeon in 6 cases suggested a dominant platelet component in the context of acute hyperaggregability. The transcutaneous compression of the thrombus by the Doppler probe lead to a reduction of its thickness in 9 cases, supporting this platelet-based composition. Thrombus adhesion might result from a small focal ulcerative atheromatous plaque as demonstrated in 4 histologically documented cases. These microplaques were missed by the usual macroscopic vascular technics. Conclusion: Such thrombi seem to be due to acute platelet hyperaggregability which often results from an essential or a reactive thrombocythaemia (64% of patients). This hypothesis may lead us to evaluate the global platelet activity and the generation of thrombin in a further study. An ulcerative microplaque could explain the adhesion of the thrombus in this singular vascular location.

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Characterization of patients with recurrent ischemic stroke using the ASCO classification

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Background: The ASCO score has the advantage of a comprehensive characterization of ischemic stroke patients and their risk factors as reflected in different grades of evidence of atherosclerotic changes (A) small vessel disease (S), potential cardiac (C) or other (O) sources. It might also help to characterize patients with recurrent ischemic stroke and document changes of etiology and development of risk factors.

Methods: We prospectively screened our stroke database with about 7000 patients for recurrent ischemic stroke between 2004 and 2011. At each event, patients underwent a stroke work-up in our hospital. Patients were classified using ASCO, distribution of etiologies and changes in ASCO score were analyzed.

Results: We identified 131 patients with recurrent ischemic stroke treated twice in our stroke center. The mean time between both events was 19.2+/−14.4 months. At the first event, 97 grade 1 etiologies were detected (A=18/S=32/C=44/O=3). Distribution of less evident etiologies was 6 grade 2 and 199 grade 3 etiologies (A=94/S=92/C=13/O=11). Overall 85 patients (64.9%) showed a modification of the score. In 28 cases (21.4%) a new, additional or different grade 1 etiology was found.

Conclusions: Recurrent ischemic stroke is not always of the same etiology as the previous one. Among variable changes of
grade 1 etiologies, an increasing prevalence of cardioembolism – often insufficiently treated – at stroke recurrence was a major finding. This strengthens the importance of continuous medical advice to patients, in particular if with new anticoagulants regular appointments for blood controls become unnecessary. ASCO proved to be highly useful to monitor risk factor constellations.

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**Thrombus associated to anemia as a cause of stroke**

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Background: Iron deficiency anemia is a risk factor for thrombus formation. It is considered a rare cause of stroke in adults. Aim: To analyze clinical cases of thrombus associated to anemia recorded in the Stroke Unit of a University Hospital. Methods: Review of prospectively collected clinical cases of stroke related to endoluminal thrombus associated to anemia admitted to a stroke unit, from 2004 to 2011. Patients’ gender, age, vascular risk factors, cause of anemia, hemoglobin level, thrombus location and characteristics, associated prothrombotic factors, treatment, outcome and stroke recurrence were registered.

Results: Five female patients were collected with age ranging from 41 to 50 years-old. Hemoglobin levels varied from 7.4 to 11 g/dL. All cases had microcytic and hypochromic anemia with decreased serum iron levels. Two patients had associated thrombocytosis. In the majority of patients, anemia was due to menorrhagia. In four cases the thrombus was located in the origin of the internal carotid artery and was initially visualized by carotid ultrasound. In one patient the thrombus was located in the aorta. The thrombus presented as a mobile hypodense mass with smooth margins adherent to the arterial wall. Four patients were treated in the acute phase with low molecular weight heparin. Resolution of thrombi ranged from 9 to 13 days. After acute stroke treatment, patients were treated with aspirin. The cause of anemia was treated and all patients received iron supplements. There were no stroke recurrences during a follow period with a median time of 23 months.

Conclusion: All collected patients were young women with iron deficiency anemia. Thrombi were mainly located in the origin of the internal carotid artery. In all cases the thrombus resolved in average 10 days after beginning of treatment. Our series reinforces this entity as a rare cause of stroke mainly in young women.

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**High molecular weight kininogen and the risk of myocardial infarction and ischaemic stroke in young women: results from the RATIO case-control study.**
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Background – Deficiency of high molecular weight kininogen (HWMK) is associated with an increased aPTT, but not with a bleeding diathesis. HWMK has no enzymatic property, but is a cofactor in the activation of the intrinsic coagulation proteins and is also important in other biologic processes, e.g. bradykinin is released upon cleavage of HWMK by kallikrein. It is unclear whether HWMK plays a role in the aetiology of myocardial infarction (MI) and ischaemic stroke (IS).

Methods – The RATIO case control study included young women with MI (N=205), IS (N=175) and 638 female controls (frequency matched on area of residence, age and year of event, all aged 18-50). All women filled in a questionnaire on risk factors for arterial thrombosis, among which oral contraceptive use. Antigen levels of HWMK were measured with a polyclonal ELISA based assay and expressed as percentage of normal pool plasma. Odds ratios (OR) and 95% confidence intervals (95%CI), adjusted for matching factors, were calculated as measures of relative risk. High levels were determined by the 90th percentile cut off, whereas a dose response analysis was performed with categories based on the quartiles of the control group.

Results – Traditional risk factors such as smoking and diabetes were more common in patients than in controls. Mean HWMK level in MI cases was 117, which was similar to that in the control group (mean difference 0.0, 95% CI -3.5 to 3.5); the level in IS cases was somewhat higher (4.0, 0.2 to 7.8). High levels of HWMK were associated with an increase in risk of IS (OR 1.73, 95%CI 1.01 - 2.97) whereas the risk of MI was not substantially affected (1.28, 0.77 - 2.15). The dose response analysis showed a U-shaped risk pattern with the highest risks for IS in the lowest and highest quartiles. Conclusion - In young women, HWMK may be a risk factor for IS, whereas its role in MI aetiology is limited. The U-shaped risk pattern warrants further investigation.

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RATE OF ATRIAL FIBRILLATION IN A NEUROLOGY-STROKE DEPARTMENT. ROLE OF THE NEUROLOGIST IN VASCULAR PREVENTION  
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Background: Atrial fibrillation (AF) is the most common chronic cardiac arrhythmia, and a very important risk factor for stroke (STR), too. In 20% of the patients stroke is caused by AF. AF is associated with a five times higher risk of stroke, compared to patients without atrial fibrillation. STR has a worse prognosis when atrial fibrillation is present: the probability of death within one year is 50%. Therefore, the detection and treatment of atrial fibrillation is essential.
Patients and method: The authors reviewed the history of patients with AF treated in a neurology department – providing management for patients with acute stroke - in 2010. AF was present in 13.6% of 2311 patients. These 314 patients were divided into five groups: 1) patients admitted for first acute stroke, 2) patients with previous stroke admitted for a new STR event, 3) patients with a history of STR, but admitted for a different reason, 4) transient ischemic attack (TIA), 5) patient history or reason for hospitalization did not include cerebrovascular disease. Patients were further classified into subgroups according to whether they had a previously known/treated AF, and based on CAH2DS2-VASc-score.

Results: In 23.2% of patients, AF was revealed during neurological care. Groups 1 and 2 included 69.7% of patients, group 3 16.7%, and group 4 only 1 patient. The STR-negative group 5 included 10.6% of patients. The CAH2DS2-VASc-score was highest in groups 1 and 2, and the lowest in group 5.

Conclusion: The number of patients diagnosed with AF at our department is higher than what AF’s stroke promotive effect would suggest. These data suggest that neurology departments have an important role in the diagnosis of AF, thereby in efficient vascular prevention, even among patients who seem to have no vascular risk.

**Etiology of stroke and risk factors**

Phenotypic (ASCO-) characterisation of patients with Fabry’s disease and acute ischemic stroke

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Background: Fabry’s disease is rare (< 1% among young stroke patients) but supposed to be associated with a higher risk for ischemic stroke. The phenotype and risk factor constellation of such patients, however, has not been evaluated and etiology related subtyping of strokes followed traditional classifications. The ASCO score is a recent phenotypic classification system, which allows a comprehensive characterization on an evidence-based level scoring of patients with acute ischemic stroke.

Methods: Prospectively collected data of the large European multicentersifap 1 (Stroke in young Fabry Patients) study was analyzed. Patients with identified Fabry’s disease were characterized with the ASCO score.

Results: Twenty-three patients with proven Fabry’s disease were analyzed in detail. Distribution of Grade 1 etiologies was as follows: 2xA, 0xS, 1xC, 23xO. Grade 2 etiologies were 1xA, 7xS, 0xC, 0xO. Grade 3
angiography are odd, seem rare but may be misdiagnosed. Their aetiology is still being discussed. Our aim was to better define their cause.

Material and methods: a multicenter retrospective study has collected 11 cases of thrombi in those arteries. Thrombi associated with an atheromatous stenosis or due to a cervical artery dissection were not included. Eleven patients (4 men and 7 women), aged 49 ± 11 years were hospitalized for ischemic strokes (N: 9) and for TIAs (N: 2). All the patients underwent a Duplex scanning, some of them also underwent intrarterial angiography (N: 5) and/or magnetic angiography (N: 5). Six patients had their thrombus surgically removed.

Results and Discussion:
The main cause was haematological (7/11 cases): essential thrombocythaemia in 3 cases, reactive thrombocytosis due to an iron deficiency in 3 cases (the platelet count was from 560 000 to 687000 /mm3) and a circulating lupus anticoagulant in 1 further case. The white coloured thrombus noticed by the surgeon in 6 cases suggested a dominant platelet component in the context of acute hyperaggregability. The transcutaneous compression of the thrombus by the Doppler probe lead to a reduction of its thickness in 9 cases, supporting this platelet-based composition. Thrombus adhesion might result from a small focal ulcerative atheromatous plaque as demonstrated in 4 histologically documented cases. These microplaques were missed by the usual macroscopic vascular technics.

Conclusion: Such thrombi seem to be due to acute platelet hyperaggregability which often results from an essential or a reactive etiologies were most prevalent: 2xA, 12xS, 5xC, 0xO.

Conclusions: Although young stroke patients with Fabry’s disease presented without high level of evidence etiologies, they demonstrated typical risk factor constellation of elderly ischemic stroke patients with moderate evidence, especially a high prevalence of small vessel disease. This makes it difficult to anticipate Fabry’s disease. Further investigations are needed to understand the role of Fabry’s disease in development of acute ischemic stroke in young adults.

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WHAT SHOULD WE THINK OF ISOLATED FOCAL THROMBUS IN THE COMMON CAROTID ARTERY
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Background: Focal adherent thrombi in the common carotid artery without demonstrable atheroma on Duplex scanning or
Background: Hipertriglyceridemia is considered to be an independent atherogenic risk factor, due to its specific path in lipid metabolism cascade. The aim of this study was to estimate the role of triglycerides in patients with asymptomatic carotid disease.

Methods and Results. The investigation was performed in 180 patients with acute ischemic stroke (AIS). Serum lipid analysis was done 3 days, and 30 days after the onset AIS. At the same time, some haemostatic factors were analysed (antitrombin III, PAI-1, D-dimer, Protein C and S, and platelet aggregation). The diagnosis of the AIS was based on clinical parameters and CT scanning. The results showed significance positive correlation (p<0.001) for the elevated concentrations LDL-Hol and PAI-1 and D-dimer in the first 3 days, and significance negative correlation (p<0.001) for the LDL-hol and antitrombin III. The negative significance (p<0.01) was protein C and platelet aggregations. This trend of significance persisted during the next period of observation although with lower correlation of significance.

Conclusion. The results of this study show clear and strong correlation between the atherogenic disorders of the lipid status and disorders of haemostatic factors with elevated concentration of the procoagulant factors and the insufficient fibrinolytic activity in patients with AIS.
were divided in subgroups according to the severity of carotid atherosclerosis, which was assessed by color-duplex ultrasonography, using standard five graded scale. There were twenty subjects in the control group. The levels of triglycerides, HDL, LDL and total cholesterol, apoprotein A1 and B were determined, as well as their relative relations.

The mean values of triglycerides were significantly higher in the whole group of patients (p<0.01) as well in the patient subgroups with high graded stenosis (p<0.05) compared to the control group. There were no statistically important significance between each subgroups, except between the subgroups graded I and IV/V level of carotid stenosis (p<0.05). In patients with hipertryglyceridemia, a decrease of HDL cholesterol and the increase of apoprotein B reached statistically significant level (p<0.05), while other lipid parameters showed no statistical significance.

Conclusion: Hipertriglyceridemia is important risk factor for carotid atherosclerosis, probably independent of cholesterol level, since the changes of lipid parameters that we found could be explained as a consequence of derranged metabolisim induced by hipertriglyceridemia itself.

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Haptoglobin 2 Allele Associates with Symptomatic Carotid Stenosis and Major Cardiovascular Events


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Haptoglobin (Hp) is a plasma protein which binds free hemoglobin (Hb) protecting tissues from iron-induced oxidative damage and promoting Hb clearance via macrophage CD163 receptor. There are two common alleles for Hp (Hp1 and Hp2), which influence its capacity to bind Hb and induce down-stream signaling via CD163+ macrophages. We have previously shown that the CD163-heme oxy-genase-1 (HO1) pathway is upregulated in symptomatic carotid stenosis (CS) and other groups have associated Hp2-2 genotype with cardiovas

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21. European Stroke Conference

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Background: Etiologic classification of patients with TIA is very important since it permits an adapted secondary prophylaxis. The ASCO score is a phenotypic classification of ischemic stroke, which permits a detailed characterisation of the etiologic profile of each patient. In another study from our department, we found that the etiology of recurrent stroke is in many cases different from the initial stroke and aimed at evaluating if this is also the case with transient ischemias.

Methods: We prospectively screened our stroke database for patients who presented with TIA first and later with ischemic stroke. Using the ASCO classification, patients were phenotypically characterized at each event. Distribution of etiologies and changes in the ASCO score were documented.

Results: We identified only 25 patients matching with our criteria. Mean time interval was 30.2 +/- 20 months. At the first event, distribution of etiology was as follows: grade 1 n=12 (2xA, 10xC), grade 2 n=2 (1xA, 1xS), grade 3 n=45 (18xA, 23xS, 2xC, 2xO), grade 0 n=37, grade 9 n=4 (4xC). At the second event grade 1 n=20 (6xA, 4xS, 10xC), grade 2 n=3 (2xA, 1xC), grade 3 n=37 (12xA, 20xS, 3xC, 2xO), grade 0 n=31, grade 9 n=9 (1xA, 8xC) were found. Overall, in 8 cases the ASCO score remained unchanged, whereas in the other 17 patients 21 subtype characteristics were modified at the second event. Detailed anal-

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ASCO classification of patients with initial TIA followed by ischemic stroke.
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1426 individuals with carotid ultrasound examination data from the Health 2000 Survey, an epidemiological cross-sectional health survey carried out in Finland in the year 2000. In the Health 2000 population, the Hp genotype frequencies were 0.170 (Hp1-1), 0.445 (Hp1-2) and 0.386 (Hp2-2) consistent with Hardy-Weinberg equilibrium and with those reported from caucasian populations. In the CS patients, the genotype frequencies were skewed towards the Hp2-2 genotype but not significantly. However, among the patients with symptomatic CS (ipsilateral TIA or stroke), the frequency of Hp2-2 genotype was significantly higher than in the control population (0.528 vs 0.386, P=0.044). In the Health 2000 population, Hp2 allele was associated with an increased risk of major cardiovascular events (major coronary heart disease event, ischemic stroke or TIA; 13.3% vs 8.3, P=0.032) and the increased risk was present regardless of diabetes. Hp2 allele carriers tended to have higher IMT values. Hp2 allele associates with the risk of symptomatic CS and major ischemic cardiovascular events. This is likely due to the defective ability of Hp2 to block oxidative reactions mediated by iron/heme, to clear free Hb present in intraplaque hemorrhages as well as the effects of the Hb-Hp2 complex on intracellular signaling cascades via the CD163 receptor.
Methods: Contrast MRI and time-resolved imaging of contrast kinetics (TRICKS) were performed in 23 patients of TMB without carotid stenosis and 23 age-and sex-matched controls. The calibers of internal jugular veins (IJVs) were assessed at C1 level. The venous caliber was scored as follows: 0, normal round or ovoid appearance; 1, mild flattening; 2, moderate flattening; and 3, severe flattening or not visualized. Results: Of the 23 patients, the mean age was 49.2 +/- 17.8 years old, with 10 females, and that of controls was 50.1 +/- 15.3 with 10 females. Severe flattening or not visualized of IJVs at C1 level were found in 6 patients and none in the controls. The venous caliber of IJVs at C1 level scored >/=1 were significantly higher in patients than in controls (87.0% vs 34.8%, p=0.0003); If taking the venous caliber scored >/=2 as significant cerebral venous outflow impairment, then outflow impairment was found in 13 patients and only in 2 controls (56.5% vs 8.7%, p= 0.0005).

Conclusions: patients with TMB without carotid stenosis had impairments of cerebral venous outflow. The role of venous hypertension as an etiology needs further study.

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**Cerebral venous outflow impairment in patients of transient monocular blindness without carotid stenosis**

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Background: The etiology of patients with transient monocular blindness (TMB) without carotid stenosis has been linked to venous hypertension because of higher frequency of internal jugular venous values incompetence (IJVVI). To substantiate the venous theory, this study was to examine whether TMB patients have the venous outflow abnormality which most seen in the patients of chronic cerebrospinal venous insufficiency (CCSVI).

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**EFFECTIVENESS AND SAFETY OF INTRAVENOUS THROMBOLYSIS IN DIFFERENT ETIOLOGIC SUBTYPES OF ISCHEMIC STROKE ACCORDING TO A-S-C-O CLASSIFICATION**

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A-S-C-O classification may be helpful to identify stroke subtypes with different response to IVT.

Patients & Methods: Patient with acute ischemic stroke, treated with IVT in our Stroke Unit from January 2009 to December 2011. Patients were re-classified according to A-S-C-O classification. We analyzed IVT effectiveness (NIHSS score ≤ 1 at 24 hours and modified Rankin Scale [mRS] at 3 months) and safety (hemorrhagic transformation and mortality) for each stroke phenotype. RESULTS: 190 patients were treated with IVT. 11.6% were classified as A1, S1=2.6%, C1=36.3% and O1=1.6%. 49.5% presented atherothrombotic features grading as A1, A2 or A3; S1, S2 or S3 phenotypes were observed in 45.8%; C1, C2 or C3 in 63.2% and O1, O2 or O3 in 2.6%. A higher rate of death or poor outcome at 3 months (mRS≥2) was observed in S1, S2 or S3 group (59.5% vs 41.7%;p=0.03), but not in S1 patients. Less patients with C1 phenotype scored ≤1 on NIHSS at 24h (15.7% vs 36.1%,p=0.01). Mortality occurred only in patients with any grade of cardioembolic phenotype (C1, C2 or C3): 14.7% vs 0%,p=0.02). No significant differences in hemorrhagic transformation rate were observed. After multivariate analysis, baseline NIHSS (OR: 1.12 (IC95%:1.1-1.3);p<0.001) and S1, S2 or S3 (OR:3.03 (IC95%:1.2-7.8);p=0.02) remained as independent predictors of poor outcome.

Conclusions: Small vessel features (S1, S2 or S3 according to ASCO criteria) are associated with death or dependency after IVT. Cardioembolic features (C1, C2 or C3) are associated with mortality and C1 with lower early recovery rate. A-S-C-O classification may be helpful to identify stroke subtypes with different response to IVT.
unilateral and 2 with bilateral, aged 35-59 (mean age 47.6) were evaluated in the last 11-years period. The ICAD diagnosis was established in all cases using MRI, MRA and duplex sonography.

Results: Facial and neck pain and Horner’s syndrome were the only presenting symptoms in 5 patients; headache and visual disturbances in 1; facial pain, Horner’s syndrome and contralateral sensorimotor deficit in 6; headache and contralateral sensorimotor deficit in 4; and contralateral sensorimotor deficit in 9. ICAD was triggered by mild trauma in 6 patients (1 while unloading sacks of corn, 1 following sudden head turning, 2 during sports activity, 1 during sexual intercourse, and 1 in car accident), and spontaneous in 20. MRI revealed infarction in 19 patients, while in the 5 patients presenting with facial and neck pain and Horner’s syndrome and in one patient with visual disturbances MRI did not show infarction. Good outcome (defined as modified Rankin score 0-2) was seen in 24 patients (96.0%). Recanalization of ICAD was associated with a favorable prognosis. There was no lethal outcome in our series.

Conclusion: The clinical presentation of ICAD is variable and can be similar to other stroke etiologies.

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Effect of Body-Mass Index and Metabolic syndrome on Ischemic Stroke Outcome

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Background: Metabolic syndrome (MS) is associated with increased risk of stroke, regardless of gender and ethnicity; the association is stronger for ischemic stroke. Recent data indicates that MS may have adverse impact on acute stroke outcomes. We conducted a retrospective analysis in order to elucidate the impact of body mass index (BMI) and metabolic syndrome on ischemic stroke outcomes.

Methods: Data for patients of ischemic stroke was obtained from the Virtual International Stroke Trials Archive (VISTA). Patients were categorized into BMI (Body Mass Index) categories: 0-18.4, 18.5-24.9, 25-29.9, 30-34.9, 35-39.9 and ≥ 40. MS was defined as presence of diabetes mellitus plus two of the following – hypercholesterolemia / hypertension/ BMI> 30. Poor outcome was defined as mRS ≥ 3. Stroke outcomes (mRS, mortality at 3 months) were analyzed in relation to BMI and MS.

Results: Data was available for 4412 patients (51.7% males); mean age 68.6±SD 12.7 yrs ; mean baseline NIHSS 12.8±SD 5.4; 1756 (35.5%) were thrombolysed (rTPA). MS was present in 369 (8.4%). No significant difference observed between patients with/ without MS in 90 day mortality (18.2 vs 16.3%) or frequency of poor outcome (51.7 vs 47.1%). In relation to BMI, stroke outcomes followed U-shaped curve; worst outcomes in patients with BMI< 18.5. Difference in outcomes for patients with BMI < 25 vs ≥ 25 were significant; patients with BMI> 25 had better stroke
Background: The effect of adherence to antihypertensive therapy on the prognosis of patients who have had a stroke is not clear. The aim of our study was to assess the relationship between adherence to antihypertensive therapy and rates of death and dependency for patients who had experienced ischemic stroke.

Methods: Using the China National Stroke Registry, we analyzed data from 8409 patients with hypertension who had been diagnosed with ischemic stroke. Adherence to antihypertensive therapy (≥75% = high; <75% = low) was measured by patient self-report at 3, 6 and 12 months after stroke. We used logistic regression to assess the relationship between adherence and the rates of death and dependency (modified Rankin Scale ≥3) at 12 months. Results: Adherence to antihypertensive therapy varied: high adherence = 31.6% (n = 2659 / 8409); low adherence = 49.3% (n = 4147 / 8409); untreated = 19.1% (n = 1603 / 8409). Adherence enhanced prognosis. Compared with untreated patients, patients with either high or low adherence had a significantly lower rate of death (adjusted OR, 95% CI): high adherence = 0.35, 0.27 to 0.44; low adherence = 0.62, 0.52 to 0.74. Compared with untreated patients, patients with high adherence, but not low adherence, also had a significantly lower rate of dependency: high adherence = 0.81, 0.67 to 0.98; low adherence = 1.03, 0.86 to 1.23.

Conclusion: High adherence to antihypertensive therapy can significantly reduce death and dependency rates at 12 months in patients who have had an ischemic stroke.
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Ischaemic stroke sub-classification using Causative Classification of ischaemia stroke System (CCS) program

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Background

Etiological sub-classification of ischaemic stroke is important in management of patients. The ASCO (A- atherosclerosis, S- small vessel disease, C- cardiac source, O- other causes) and its automated version- Causative Classification System (CCS) are helpful in determining the most likely mechanism in the presence of competing mechanisms.

Aim

To establish etiological ischaemic stroke subtypes on different age groups and gender distribution in our institution.

Methods

A database of stroke patients in our hospital was reviewed and those with diagnoses of ischaemic stroke admitted from the first of January 2011 to the thirtieth of June 2011 were selected. Their clinical data were used to categorise them into different causative sub-classification using CCS program (https://ccs.mgh.harvard.edu). This was done by a single physician after undergoing training online using published scheme.

Results

One hundred patients were admitted with ischaemic stroke. Ten patients were aged less than (<) 65 years, 43 aged between 65-79 years and 47 equal to or greater than (=>) 80 years of age. There were 43 females [3(7.0%) < 65 years, 8(18.6%) aged 65-79 years and 32(74.4%) aged => 80 years] and 57 males [7 (12.3%) < 65 years, 35(61.4%) aged 65-79 years and 15(26.3%) aged =>80 years]. Thirty-three percent of patients were classified as cardio-aortic embolism (19% males, 14% females), 14% small artery occlusion (7% males, 7% females), 20% supra-aortic large artery atherosclerosis (13% males, 7% females), 14% other causes (7% males, 7% females) and 19% as undetermined causes (11% males, 8% females). The difference between gender and stroke subtype was statistically
Background: Impaired glucose tolerance (IGT) is at risk for carotid atherosclerosis. However, there are few reports assessing the prevalence of diagnosed IGT in carotid stenosis. This study investigated the prevalence of disorders of glucose metabolism in carotid stenosis.

Methods: We recruited 87 carotid artery stenosis patients. 75-gram oral glucose tolerance test (OGTT) was performed and homeostasis model assessment for insulin resistance (HOMA-IR) was calculated in patients without previously diagnosed diabetes. We investigated the prevalence of abnormal glucose metabolism and whether insulin resistance is associated with carotid atherosclerosis in individuals who were shown not to have diabetes mellitus based on results of the OGTT.

Results: Among 87 patients, 29 patients with a previous diagnosis of type 2 diabetes were not subjected to OGTT. Analysis of 58 carotid stenosis patients who underwent OGTT showed that 21 (36%) patients had normal glucose tolerance (NGT), while 28 (48%) patients had IGT, 7 (12%) patients had diabetes, and 2 (3%) patients had impaired fasting glucose (IFG), based on 75-gram OGTT. Among subjects with IGT, only 4 patients had IGT with IFG. Among the patients who underwent OGTT, the mean HOMA-IR was higher in the subjects with abnormal glucose metabolism (p=0.074) than NGT subjects.

Conclusion: In this study, a large percentage of Japanese patients with carotid stenosis and no history of diabetes were found to have disorders of glucose metabolism.

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The high prevalence of impaired glucose tolerance is evident among carotid artery stenosis

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by OGTT. Impaired glucose tolerance and insulin resistance could have play a pathogenic role in the development of carotid atherosclerosis.

The association between disturbed glucose metabolism and endothelial dysfunction in patients with ischemic stroke or TIA.

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Background
Disturbed glucose metabolism is often present after TIA and ischemic stroke, and is associated with an increased risk of recurrent stroke. Endothelial dysfunction might be one of the underlying mechanisms. We therefore assessed the association between disturbed glucose metabolism and von Willebrand Factor (vWF), a marker of endothelial dysfunction, in patients with recent TIA or ischemic stroke.

Methods
We evaluated all patients with recent ischemic stroke or TIA between February 2006 and November 2010. Non-diabetic patients underwent an oral glucose tolerance test. Patients were classified as having normal glucose metabolism (NGM, fasting glucose level <5.6mmol/L and 2-hour post load glucose level <7.8mmol/L), prediabetes (fasting glucose levels 5.6-6.9mmol/L and/or 2-hour post load glucose levels 7.8-11.0mmol/L) or diabetes mellitus (fasting glucose level >=7.0mmol/L and/or 2-hour post load glucose level >=11.1mmol/L or the use of antidiabetic drugs). Blood was collected for measurement of vWF levels within 2 weeks after the event. We compared log transformed vWF levels between the glucose subgroups, with NGM as a reference. The relation between glucose and vWF levels was expressed as a coefficient for 1mmol/L increase in glucose. Adjustments for age, sex, hypertension, hypercholesterolemia, smoking, blood group and TIA vs ischemic stroke were made with a multivariable linear regression model.

Results
Of the 798 patients 236 (29%) had NGM, 276 had prediabetes (35%) and 286 (36%) had diabetes mellitus. vWF levels were significantly higher in patients with prediabetes and diabetes than in those with NGM (mean (SD) resp. 1.56 (0.70), 1.65 (0.66) and 1.45 (0.61), p-value <0.001). Two-hour post-load glucose levels were significantly associated with vWF (beta 0.0080, 95% CI 0.0001-0.0158).

Conclusion
vWF levels were increased in patients with a recent TIA or ischemic stroke and prediabetes or diabetes mellitus compared to NGM, indicating endothelial dysfunction.
Background: The pattern of transcranial Doppler (TCD) velocities in adults with sickle cell disease (SCD) is different from that described in children. Our group has previously shown that the frequency of brain imaging abnormalities detected by MRI/MR angiography (MRA) in adults with SCD is higher than that described for children. The meaning of TCD results and MRI abnormalities in the long term follow-up in adults with SCD is not well established. Our aim was to describe the risk of stroke and death in a follow-up of seven years of adult patients with SCD initially evaluated with TCD and MRI. Methods: We examined all adult patients (>16 years) with SCD followed in our hematology outpatient clinic with MRI, MRA, and TCD between July 2003 and December 2004. The patients were followed in our Hematology outpatient clinic and a follow-up visit was done between January and September 2011.

Results: We evaluated 50 patients. The overall prevalence of MRI abnormalities was 60%. A time-averaged maximum mean velocity of 123.5 cm/s allowed the diagnosis of middle cerebral artery (MCA) or internal carotid artery intracranial stenosis with sensitivity of 100% and specificity of 73% (area under the receiver operator characteristic curve of 0.91, CI, 0.79 to 1.00). Three patients died and one patient had a stroke in the long term follow up. There were no differences in the brain MRI or TCD findings of patients who died and those who survived. The only patient who had a stroke had tortuosity of the intracranial vessels on brain MRA and asymmetry of TCD velocities (defined as interhemispheric flow velocity difference of 30 cm/s between segments in the MCA).

Conclusions: Brain MRI/MRA findings were not predictors of death or stroke in adults with SCD. TCD asymmetry was found in the only patient who developed a stroke during the long term follow up and might be a marker of risk in those patients. Age-specific TCD criteria may assist the detection of stroke risk in adults with SCD.

Is the susceptibility to carotid atherosclerosis reduced in small vessel disease?

Evidence from a population-based study

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Severity of carotid stenosis similarly in both the LACI and non-LACI groups, but smoking tended to be more strongly associated with stenosis in patients with non-LACI events \((p=0.003)\) than in those with LACI events \((p=0.419)\).

CONCLUSION: Within a Caucasian population, patients with lacunar events have a similar risk factor profile to those with non-lacunar events and a similar frequency of PVD and coronary disease, but less severe carotid stenosis, possibly due to reduced susceptibility to atherosclerosis at the carotid bifurcation.

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**HIGHER LEVELS OF URIC ACID ARE RELATED WITH LOWER STROKE INCOME SEVERITY**

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Introduction: Uric acid plasmatic levels (UA) and stroke relation is nowadays much debated, existing studies which associate higher UA with less severity and better outcome. Material and Methods: Observational study of stroke patients admitted in the stroke unit at La Paz University Hospital from 2009 to 2010. We analyze UA plasmatic levels with stroke income severity measured by the NIHSS (low-moderate when NIHSS 0 to 15) and outcome disability measured by the mRS (considering good outcome if mRS 0-2). Demographical data, vascular risk factors, previous treatment...
and type of stroke are analyzed. Results: 512 patients, mean age 68.18 ±14 years old, 62.5% are male. UA average levels 5.63 ± 1.7 mg / dl. COR curve shows that UA> 5.2mg/dl are associated with lower income stroke severity (sensitivity 60% and specificity of 60%) (p = 0.001). Patients with UA levels over 5.2 mg/dl are more often male (65% vs. 35%, p<0.0001), have more frequently hypertension (59.8% vs. 40.2% p= 0.016) and better outcomes at discharge (60.3% vs. 39.7%, p = 0.010). Multivariate analysis shows that UA> 5.2 mg / dl are independently associated with lower income stroke severity (OR 2.748, 95% CI 1.573 to 4.799) adjusted by demographic data, vascular risk factors, glycemia at admission and previous treatment. Conclusions: UA levels higher than 5.20 mg/dl are independently related with lower income stroke severity.

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**Stroke in older elderly people**

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Purpose: The aim of this study was to clarify the features of stroke in older elderly people aged >=75 years. Materials and Methods: Between February 2008 and April 2011, 722 stroke patients were enrolled and observed prospectively. Patients aged >=75 years were classified as “elderly” and the remainder as “younger.” Results: Of the 722 patients, 380 (52.6%) were “elderly” (mean age, 82.7) and 342 were “younger” (mean age, 63.5). In these patients modified Rankin scale (mRS) prior to ictus was 1.30+/-1.56 (median, 1) and 0.38+/-0.89 (median, 0) (p<0.0001) and independent (mRS, <=2) ratio prior to ictus was 76.7% and 95.6% (p<0.0001), respectively. NIHSS score on admission was 7.47+/-8.11 (median, 5) and 5.01+/-6.55 (median, 3), respectively (p<0.0001). The incidence rate of each stroke type (infarction, intracerebral hemorrhage, SAH, and TIA) was not different. In subtypes of infarction, atheroma thrombosis and cardiogenic embolism were more frequent in elderly patients, whereas lacuna infarction was more frequent in younger patients (p=0.0001). In elderly and younger patients, NIHSS, mRS, and Barthel index at discharge were 6.45+/- 10.10 (median, 2) vs. 3.31+/-6.88 (median, 1) (p<0001), 2.68+/-1.83 (median, 3) vs. 1.45+/-1.66 (median, 1) (p<0.001), and 62.0+/-38.9 vs. 86.3+/-28.6 (p=0.001), respectively. Independent (mRS, <=2) ratio at discharge and 3, 6, 12, and 24 months was 46.8% and 76.6%, 49.5% and 81.4%, 52.4% and 83.0%, 50.9% and 83.7%, and 41.7% and 79.6%, respectively (p<0.001). Even in patients those who were independent (mRS, <=2) prior to ictus, independent ratio at discharge and 3, 6, 12, and 24 months was 59.5% and 80.1%, 63.0% and 85.1%, 65.2% and 86.9%, 62.9% and 88.5%, and 48.8% and 83.5%, respectively (p<0.0001). In elderly and younger patients, recurrence of stroke was observed in 8.0% and 4.1% per person-year, respectively (p<0.0001). Conclusion: Stroke in older elderly people aged >=75 years is often more serious than in younger patients and tends to recur. Poststroke, the likelihood of
returning to independent daily life is much lower in older patients. Stroke prevention is therefore an important aim in the older elderly.

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Stroke and syphilis—really an assailant?
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Background: Syphilis is a debilitating multisystem disease resulting from infection with the spirochete Treponema Pallidum. Meningovascular syphilis (10% of all cases of neurosyphilis) involves an infection-associated inflammatory arteriopathy resulting in injury to the blood vessels of the leptomeninges, brain and spinal cord leading to infarctions. The syphilitic arteritis knows as Heubner involves large and medium sized vessels and small vessels arteritis is known as Nissl-Alzheimer arteritis.

Case reports:
Case 1: A 38-years old right-handed man, without any relevant medical history and without known vascular risk factors, was referred to our hospital for headache, dysarthria, right ataxic hemiparesis and right hemihypoesthesia. Cerebral MRI showed acute left lenticulo-thalamic infarct, CSF examination revealed VDRL negative and TPHA positive, and TPHA, VDRL and RPR were positive in serum.
Case 2: A 49-years old right-handed man, without any relevant medical history presented with somnolence, global aphasia and left hemiparesis Cerebral MRI showed acute infarction in the profound territory of the right sylvian artery. CSF VDRL and TPHA and serum TPHA and VDRL were positive.

Discussion: Meningovascular syphilis is a disease with peak occurrence at 4 to 7 years after primary infection. A high index of suspicion is required in patients who fit the risk factor profile for the disease. In young individuals with cerebral or spinal cord infarcts, in those with unclear etiology of their stroke, and with characteristic imaging appearance, screening for syphilis cannot be overemphasized. Because meningovascular syphilis is a treatable condition, it is recommended to include syphilis serology as screening tests in stroke cases, mostly in young people.

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Visual Analog Scale - the simple way to assess readiness to change smoking behavior in post-stroke patients.
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21. European Stroke Conference

Background and aim: The assessment of readiness to change smoking behaviors after stroke is a new approach. The aim of the present study was to assess the validity of 100-mm Visual Analog Scale (VAS) for predicting smoking abstinence in stroke patients. Methods: Eighty nine cigarette smokers with first-ever ischemic stroke admitted consecutively to the Departments of Neurology of the Institute of Psychiatry and Neurology between December 2005 and December 2007 were prospectively enrolled to the study. The patient’s readiness to change smoking behavior after stroke (T0, 7-10 days after stroke) was determined by VAS and a Polish version of the RTCQ (Readiness to Change Questionaire, Rollnick et al., 1992). Follow-up visits were performed at 3 months and 1 year after stroke. Results: On the basis of RTCQ score, the patients at baseline visit were classified into contemplation (n=51) and action stage (n=38). Rate of abstinence at 3-month follow-up was significantly higher for patients in action stage compared to patients in contemplation stage: 50% (19/38) and 23.5% (12/51), respectively ($\chi^2$=6.72; P=0.0095). Similar rates were found after 1 year. Results of RTCQ correlated with VAS. Higher self-reported readiness to change measured using VAS at the baseline assessment predicted a greater likelihood of smoking cessation after stroke. Conclusions: The present results may indicate that VAS may be a simple option for assessment patient’ readiness to change smoking behavior after stroke and for prediction smoking cessation after stroke. The study was supported by Institute of Psychiatry and Neurology and grant MNiN/MEiN 2 P05D 058 29

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Investigation of young adults with acute ischemic stroke in a general hospital

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Background. Most young acute ischemic stroke (AIS) patients are managed in general hospitals. We evaluated the etiology of young AIS patients in a general hospital. Methods. Risk factors and investigations in patients aged 16 to 45 years admitted to a general hospital with AIS were recorded. TOAST and ASCO (atherosclerosis, small vessel disease, cardiac source and other cause) stroke classifications were determined.

Results. 45 patients, 27 men, 18 women, mean age 36.1 (SD 8.7) years, with AIS were assessed. The most common risk factors were cigarette smoking (56%), family history of stroke in a first degree relative (24%), and excess alcohol (24%). Large artery, small artery and other determined causes were similarly distributed in the TOAST and ASCO grade 1 classifications. Although cardiac sources were more frequently identified with TOAST (22%) than ASCO grade 1 criteria (9%), this was not statistically significant. The undetermined categories in TOAST and ASCO (A0S-
TFPI gene variation and ischemic stroke

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Background: Tissue factor pathway inhibitor (TFPI) is the primary inhibitor of the tissue factor (TF)-dependent pathway to thrombus formation after vessel damage. TFPI therefore has been suggested to play a role in the pathogenesis of thrombotic disease. We investigated whether variation in the TFPI gene is associated with ischemic stroke and/or any of its main etiological subtypes.

Methods: The TFPI gene was tagged and 15 SNPs were analyzed in the Sahlgrenska Academy Study on Ischemic Stroke (SAHLSIS), comprising 844 patients with ischemic stroke and 668 controls. Etiologic subtype of ischemic stroke was defined according to the TOAST criteria. The Lund Stroke Register (LSR) and the Malmö Diet and Cancer study (MDC) served as a replication sample for overall ischemic stroke (in total 3145 patients and 1793 controls).

Results: The SNPs rs8176592 and rs8176541, which are in tight linkage (r²=1.0), showed an association with ischemic stroke in SAHLSIS, however these associations were not replicated in the LSR and MDC sample. The same two SNPs showed association in SAHLSIS with the stroke subtypes large vessel disease (LVD), rs8176592: OR 0.63 (95% CI 0.45-0.88), p=0.01; rs8176541: OR 0.63 (95% CI 0.45-0.89), p=0.01 and cardioembolic (CE) stroke, rs8176592: OR 0.72 (95% CI 0.54-0.96), p=0.02; rs8176541: OR 0.72 (95% CI 0.54-0.96), p=0.02.

Conclusion: This comprehensive study, based on a tagSNP approach and replication, does not support the hypothesis that variation in the TFPI gene is associated with ischemic stroke. To clarify whether there are associations between the SNPs rs8176592 and rs8176541 and the subtypes LVD and CE stroke our findings need to be replicated.

The Megadolicho Basilar Artery – just a finding or an underestimated disease?

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Introduction: The megadolicho basilar artery (MDBA) is a fusiform and often sidled
shows different clinical appearances of which brain stem infarctions are at high risk of non-favourable outcome. Prophylactic treatment options of high evidence are missing. We consider a prophylactic anti-platelet treatment as safe in terms of risk reduction since the rupture risk is very low. Also adequate therapy of hypertension seems relevant.

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**MIGRAINE AS CEREBROVASCULAR DISEASE RISK FACTOR**

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Background/ Patients with complicated migraine or migraine with aura may suffer migraine infarction with small incidence that fails to rise above 1% of all brain strokes. Vast majority of patients with acute cerebrovascular insult (CVI) in the whole territory of Belgrade are treated In St. Sava Hospital. Given the incidence of migraine in general population, the aim of this study was to determine migraine prevalence in patients aged up to 50 with acute CVI, as well as to prove migraine infarction within this population. Migraine prevalence up to the above said age is the largest in extent, whereas the incidence of other cerebrovascular disease risk factors is the smallest. This is why other factors minimally affected the result set forth as the objective of this study. Methods/ Statistical processing of the data obtained from the computerized...
database of St. Sava Hospital was applied. Results/ In the period from 1 Jan. 2010 to 31 Dec. 2010, 6476 patients with CVI were admitted in St. Sava Hospital. Ischemic insult occurred in 4610 of these patients, out of whom 752 patients were aged up to 50 and 50. 405 of them were male and 347 were female patients. Hetero and auto-anamnestic data revealed that, within this age group of patients, 30 male patients and 45 female patients used to have migraine headaches. Out of these 75 patients, 3 patients suffered from migraine with aura, and another patient, a woman aged 38, had hemiparesis on the right within the aura. This neurological deficit was retained even after the migraine attack. Neuro-imaging methods confirmed the left temporal-parietal position of an ischemic lesion. This case represents the only confirmed instance of migraine infarction. Conclusion / This study showed that migraine prevalence in patients with acute CVI is not larger than migraine prevalence in general population. In addition, a single instance of migraine infarction was confirmed in a female patient who suffered from migraine with aura.

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Prevalence of Stenoses and Occlusions of Extracranial and Intracranial Brain-Supplying Arteries in Young Stroke Patients Cross-Sectional Data from sifap1


on behalf of the sifap1 Investigators

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Background: Extra- and intracranial atherosclerosis is often assumed to be a less frequent cause of stroke in young and middle-
aged patients. However, detailed data from large multicentre studies are limited.

Methods: The prevalence of extra- and intracranial atherosclerosis was prospectively assessed in patients with TIA or stroke aged 18-55 years (y.) in the international multicenter sifap1 study. Of the entire sifap1 cohort (n=5024), complete extracranial carotid ultrasound data were available for analysis in 2187 patients after the exclusion of those with dissections, vasculitis, or mobile intraluminal thrombi of any brain-supplying artery (1319 men, 868 women; 744 at age 18-44, 1433 at age 45-55). Transcranial Doppler ultrasonography was also performed to examine the intracranial arteries in 1612 of these 2187 pt. (73.7%). For statistical analysis, we stratified our cohort by age into ‘young’ (18-44 y.) or ‘middle-aged’ (45-55 y.), and by gender.

Results: The overall prevalence of carotid artery stenoses >/=50% or occlusions was 8.2% (4.6% in young, 10.0% in middle-aged, p<0.001), of which 78% were symptomatic. Non-stenotic carotid plaques were seen in 11.4% of young vs. 29.5% of middle-aged patients (p<0.001), and in 28.2% of men vs. 15.7% of women (p<0.001). The prevalence of significant intracranial artery stenoses and occlusions was 15.3%. Intracranial stenoses were more commonly observed in middle-aged than young patients (12.7% vs. 7.5%; p<0.001), but the prevalence of intracranial occlusions was similar in each age-group (4.7% vs. 4.1%; n. s.).

Conclusion: We observed a substantial proportion of atherosclerotic carotid artery stenoses and occlusions in young stroke patients. The prevalence of intracranial stenoses and occlusions even exceeded the prevalence of extracranial carotid artery disease. The considerable prevalence of atherosclerosis should encourage future stroke prevention campaigns to target risk factor modification in the young.

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Rare copy number variation in patients with cervical artery dissection.

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Background - Cervical artery dissection (CeAD) occurs in healthy young individuals and often entails ischemic stroke. Skin biopsies from most CeAD patients show minor connective tissue alterations. We search for rare genetic deletions and duplication that may predispose to CeAD.

Methods - Twenty-one non-traumatic CeAD patients with normal connective tissue in electron microscopy (EM) of skin biopsies (EM- patients) and 49 non-traumatic patients with morphologic alterations of their dermal connective tissue (EM+ patients) were analyzed. Affymetrix 6.0 microarrays from all patients were analyzed for copy number variants (CNVs). CNVs absent from 403 control subjects and from 2402 published disease-free individuals
were considered as CeAD-associated. The genetic content of identified CNVs was analyzed by Gene Ontology (GO) Term Mapper analysis to detect associations with biologic processes.

Results - In 49 EM+ patients we identified 13 CeAD-associated CNVs harboring 83 protein coding genes. In 21 EM- patients we found 5 CeAD-associated CNVs containing only 9 genes (comparison of CNV gene density between groups: Mann-Whitney p=0.039). Patients’ CNVs were enriched for genes involved in extracellular matrix organization (COL5A2, COL3A1, SNTA1, p= 0.035), collagen fibril organization COL5A2, COL3A1, (p=0.0001) and possibly for genes involved in TGF-beta receptor signaling pathway (COL3A1, DUPT22, p=0.068).

Conclusions - Rare genetic variants may contribute to the pathogenesis of CeAD, in particular in patients with an electronmicroscopic connective tissue phenotype.

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Arterial and endothelial functions in subjects with migraine with and without aura

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Background: At variance with migraine without aura (MO) migraine with aura (MA) is a risk factor for stroke and heart disease. Studies showed an impaired vascular function in migraineurs with respect to non migraineurs. We aimed to study the arterial and endothelial function in patients with MO vs MA.

Methods: Consecutive migraineurs referring to our Headache Center were included and classified as suffering from MO or MA. Atrial Pressure (AP), Augmentation Index (AIx), aortic Pulse Pressure (aPP), Ejection Duration (ED), and Flow-Mediated Dilation (FMD) were assessed. Comparisons were performed by Student’s t-test or Chi-square test. Pearson’s test was used to assess correlations.

Results - We included 68 subjects; 26.5% were men and 48.5% had MA; mean age +/- SD was similar in subjects with MA and MO (35.4 +/- 9.8 vs 37.2 +/- 10.1 years; P=0.44). Proportions of arterial hypertension, hypercholesterolemia, cigarette smoking, and metabolic syndrome were similar in subjects with MO vs MA and MO (35.4 +/- 9.8 vs 37.2 +/- 10.1 years; P=0.44). Proportions of arterial hypertension, hypercholesterolemia, cigarette smoking, and metabolic syndrome were similar in subjects with MO vs MA, along with mean AP (6.5 +/- 4.9 vs 8.1 +/- 5.8 mmHg; P=0.212), AIx (18.8 +/- 12.3% vs 22.2 +/- 13.3%; P=0.298), aPP (31.1 +/- 7.1 vs 32.5 +/- 8.2 mmHg; P=0.458), ED (38.2 +/- 4.2 vs 38.8 +/- 4.4 ms; P=0.574), and FMD (7.8 +/- 2.5% vs 8.0 +/- 2.9%; P=0.778) values. Among MO subjects, men with respect to women had lower AP (2.3 +/- 2.6 vs 8.2 +/- 4.6 mmHg; P=0.001) and AIx (6.6 +/- 5.9% vs 24.0 +/- 10.6%; P<0.001)
while among MA subjects men had lower AIx than women (11.4 +/- 17.0% vs 25.2 +/- 10.6%; P=0.013). In subjects with MA there was a correlation between age and aPP (rho=0.418; P=0.001), AP (rho=0.682; P<0.001), and AIx (rho=0.456; P=0.009); in patients with MO, age correlated with AP (rho=0.788; P<0.001) and AIx (rho=0.709; P<0.001).

Conclusions: Our data showed no differences in arterial and endothelial function between subjects with MA and MO. Age and gender showed a different influence on the parameters of vascular function in subjects suffering from MO and MA.

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Finding a definite aetiology for brain ischemia is still hard – Comparison of ASCO and TOAST classifications in a prospective serie of Finnish patients

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Introduction

The treatment of stroke patients depends on the stroke mechanism and thus the underlying cause of stroke should be determined. The cause of stroke also influences on the outcome and recurrence rate. We analyzed our study population using the novel ASCO classification and older TOAST classification.

Methods

We investigated 703 consecutive patients with brain ischemia and categorised them by the TOAST and ASCO criteria. Our data included 367 males (mean age 69.9 ± 11.8 years) and 336 females (mean age 75.8 ± 12.8 years). Brain CT, neurological examination, ECG and laboratory tests were performed on all patients. CT angiograph was done to 480 patients (68.2%) and carotid ultrasound to 101 patients. Transesophageal or transthoracic echocardiography was done to 434 patients (61.7%).

Results

The classification using ASCO (grade 1)/TOAST was as follows: Atherotrombotic (A) 11.4%/10.2%, cardioembolic (C) 34.9%/39.8%, small vessel disease (S) 2.7%/3.1%, other causes (O) 2.0%/3.0% and undetermined 49.0%/29.5%. Besides that in TOAST 14.4% of the patients had two or more causes, whereas only 28 patients (4.0%) had two aetiologies in ASCO (A1C1 or C1O1 and included in A1 or C1 categories respectively). Those patients having neither grade 1 nor grade 2 aetiology in ASCO compromised 37.5%.

Discussion

Definite aetiologies for brain ischemia might not be achieved despite of wide diagnostic work up. The distribution of different aetiologies seems to be quite similar in both classifications. After grouping definite and causality uncertain ASCO grades (1 and 2 respectively) there remains an amount of patients comparable to the undetermined group in TOAST classification.
Gene methylation is associated with blood lipid profile in ischemic stroke
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Background: There are many risk factors for stroke, including atherosclerosis and dyslipidemia. Overexpression of certain genes has been found to be associated with atheroma. Therefore epigenetic mechanisms responsible for the regulation of gene expression could be involved in atherosclerosis. We hypothesised that DNA methylation is associated with blood lipid profile in patients with ischemic stroke.

Methods: Stroke patients (n=138) and age/sex matched controls (n=60) were tested for associations between DNA methylation and blood lipid levels. Patients were classified according to TOAST classification. We included large vessel disease (LVD), small vessel disease (SVD) and cardioembolic (CE) strokes in the study.

DNA methylation status was measured in 10 selected genes: SOD3, ALOX15, LINE1, ER-alpha, MTHFR, IL10, TNF-alpha and IFNGR1 - these genes are implicated in aging, atherosclerosis and inflammation processes; PITX2 is involved in synoatrial node development, INS- insulin coding gene. Methylation was determined by pyrosequencing after bisulphite conversion of lymphocyte DNA using Epitect Bisulfite kits.

Results: The control group and CE stroke subgroup showed no correlation between gene methylation and blood lipid profile. In LVD group PITX2 methylation showed a negative correlation with total cholesterol (TC) level (n=46, p=0.048, R²=0.086). LINE1 methylation was associated with TC and LDL blood levels (n=46, p=0.002 in both cases, R²=0.202 and 0.209 respectively). In SVD group we found two positive correlations: HDL was associated with INS methylation (n=46, p=0.006, R²=0.182) and LINE1 with TC/HDL ratio (n=46, p=0.05, R²=0.099).

Conclusions: PITX2, LINE1 and INS methylation show an association with lipid profiles in LVD (positive association) and SVD (negative association) strokes. This epigenotype/phenotype interaction might contribute to the different relationships between lipid profiles and stroke subtype and warrants further investigation.

Embolic is Major Cause of the Insular Cortex Infarction.
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Background: Insular cortex involvement in
acute middle cerebral artery (MCA) territory stroke caused severe neurologic deficits and poor outcome. Rapid assessment of its stroke mechanism might be helpful to early recognition of embolic cause and treatment planning. We investigated the relationship between insular cortex infarction and pathomechanism.

Method: In this retrospective observational study, we enrolled a consecutive series of patients, who admitted Seoul National University Bundang Hospital due to acute ischemic stroke within 7 days after symptom onset from December, 2008 to December, 2010. Among them, we included those had MCA territorial infarction. We collected the demographic characteristics, medical risk factor and qualifying stroke information. Assessment of insular involvement was reviewed by Neuroradiologist. Patients were divided those with and without insular lesion and their stroke mechanism as well as clinical characteristics were analyzed.

Result: A total of 322 patients (mean age: 68.3±12.9 years old) were identified and the 18.6% of them received thrombolysis. Median baseline NIHSS score of patients with insular lesion (N=66) was 10 (interquartile range: 5-15), which was significantly worse than those without lesion (4 (2-10)). The proportion of cardioembolic stroke of patient with insular lesion was 48.5%, which were significantly higher than 27.7% of those without insular lesion (P=0.013 on Pearson’s chi-square test). Of the patients with insular lesions caused by large artery atherosclerosis (N=24), the 62.5% was mainly caused by embolism from the proximal arterial stenosis.

Conclusion: We demonstrated the more than 70 percentage of insular infarction were caused by cardioembolism and proximal arterial embolism. In management of acute ischemic stroke, we have to give more attention to embolic sources in patient with insular cortical lesion.

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HIGH PREVALENCE OF PREVIOUS SILENT BRAIN INFARCTS IN YOUNG ADULTS WITH CRYPTOGENIC STROKE AND MIGRAINE WITH AURA

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Background. Migraine with aura (MA) has been associated with an increased prevalence of silent brain infarct (SBI) in the general population. The aim of our study was to confirm this association in young adults with first-ever ischemic stroke of undetermined cause (i.e. cryptogenic stroke) and to assess the relationship between SBI and atrial septum abnormalities in these patients.

Methods. Patients aged 18-55 years admit-
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Differences of the time rate of blood pressure variation between ischemic stroke subtypes

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Background

Time rate of blood pressure (BP) variation is a measure of the speed of BP fluctuations derived from a computerized analysis of 24 hour ambulatory blood pressure monitoring (ABPM). Previous studies have demonstrated that the rate of BP variation is associated with increased target organ damage. The aim of our study was to compare the time rate of BP variation between patients with different types of ischemic stroke.

Methods

A total of 94 consecutive acute ischemic stroke patients underwent 24-h ABPM. Patients with atrial fibrillation were excluded from the study. The time rate of BP varia-
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Yield of laboratory screening for rare causes of ischemic stroke in young adults

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Our study population consisted of 16 (17.0%) with LAA, 52 (55.3%) with SVO and 26 (27.7%) with OUE. Dyslipidaemia was significantly more frequent in LAA patients compared to SVO patients. There were no other statistically significant differences regarding baseline characteristics, risk factors and 24-h BP values between the three groups.

The overall 24h rate of systolic BP variation was significantly higher in LAA (0.692mmHg/min; 95% CI 0.627-0.757) group than in SVO (0.609mmHg/min; 95% CI 0.579-0.640) and OUE (0.586mmHg/min; 95% CI 0.522-0.649) groups. The groups did not differ significantly regarding diastolic rate of BP variation.

Conclusion

Patients with LAA presented significantly higher 24h time rate of systolic BP variation compared to patients with SVO or OUE.
Background: Whether detection of rare causes of ischemic stroke in young adults differs according to screening strategy is unclear. Aim: To assess the rates of detection of vasculitis, syphilis, and thrombophilia in 2 cohorts of young ischemic stroke patients with different screening strategies. Methods: Retrospective analysis of 2 cohorts of young ischemic stroke patients (<55 years): 143 patients from Hospital de Santa Maria in Lisbon, Portugal from 2007-2009 and 213 patients from Hospital Sainte-Anne in Paris from 2008-2009. Screening for vasculitis, syphilis and thrombophilia was performed as follows, respectively in Paris and Lisbon: antinuclear antibodies (ANA) (62% vs. 80%), VDRL and TPHA (9% vs. 88%), anticardiolipin, anti-β2 glycoprotein, and lupus anticoagulant (62 vs. 80%), protein C, protein S, and antithrombin III (40% vs. 81%), RPCA (37% vs. 14%), prothrombin (33% vs. 1%) and factor V Leyden mutations (13% vs 0%) Results: The Paris and Lisbon cohorts were similar with regard to age (45.4 vs. 47 years respectively) and sex. ANA contributed to the diagnosis of systemic lupus erythematosus in 1 patient (0.01% of total determinations) in Paris cohort and 2 patients (0.02%) both with PFO in Lisbon cohort. Persistent positive ANA without other criteria for autoimmune disease were found in 4 patients (with an otherwise unexplained stroke) in Paris cohort and in 1 patient (with a PFO) in Lisbon cohort. Screening for thrombophilia allowed the diagnosis of antiphospholipid syndrome in 3 patients (2%) in Paris cohort and in 4 patients (3%) in Lisbon cohort. A deficit in Protein C or S reinforced the diagnosis of hypercoagulability in 1 patient with anemia due to iron deficiency (1%) in Paris cohort and 1 patient with cancer (1%) in Lisbon cohort. Both patients had luminal thrombus. Syphilis determinations did not contribute to any diagnosis. Conclusion: The rates of detection of vasculitis, syphilis, and thrombophilia were very low and similar in 2 cohorts of young ischemic stroke patients with different strategies of laboratory screening.

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Clinical characteristics of moyamoya disease patients suffer from acute progression of contra lateral stenosis of cerebral arteries after bypass surgery.

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Background: The pathogenesis of Moyamoya disease is the progressive stenosis and occlusion of the distal end of internal carotid arteries. Basically the stenoses are seen bilaterally. Clinical symptoms usually represent unilaterally. Bypass surgery is performed on the one hemisphere whose cerebral blood flow is low. Some cases suffer from new symptoms of contra lateral hemisphere within a few months after surgery. We examined the cases and report those clinical characteristics.

Methods: 34 consecutive surgical patients (3 to 58 years old; mean 23.1 years old) were included. Clinical symptoms were reviewed. Antiplatelet agents were used at least 4 weeks before surgery. The 178 patients had 204 bypasses. No prednisolone was used. Time to the new symptoms after surgery was calculated. Results: The new symptoms appeared in 31 patients (14.6% of 178 patients). The new symptoms were hemiparesis, ataxia, and dysphagia. The onset time of the new symptoms was 3 to 5 months (mean 4.6 months) after surgery.
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**Spontaneous echo contrast of the internal jugular vein in patients with ischemic stroke**

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Background – Spontaneous echo contrast (SEC) is a dynamic smoke-like signal that is found frequently in left atrium on transesophageal echocardiography. The purpose of our study is to determine the prevalence of SEC in internal jugular vein in patients with ischemic stroke and to investigate whether the presence of SEC is associated with a stroke subtype, carotid atherosclerosis and other vascular risk factors including hypercoagulable state.

Methods- Between May 2011 and Dec 2011, we had examined the presence and severity of SEC on bilateral internal jugular vein after routine carotid artery duplex ultrasound in consecutive acute stroke patients. The severity of SEC was graded by the qualitative criteria that was suggested in echocardiographic study. For analytical purpose, we divided the severity of SEC into two groups (severe versus mild or none). We collected the serum fibrinogen levels, vascular risk factors, ischemic stroke subtype, and other informations on index stroke using prospective registry.

Results- In this study, we enrolled 65 acute stroke patients. The severe SEC was found in 50% of right and 46.5% of left internal jugular vein. There were no significant dif-
Intima-Media Thickness of Brachiocephalic Trunk - Clinical Interpretation
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Background - Intima-media thickness (IMT) of brachiocephalic trunk (BCT) can be measured by duplex carotid ultrasoundography like as common carotid artery (CCA); however, has not been studied about its clinical background and correlation with cerebral ischemic change.

Methods - We studied 1109 stroke free participants (male 56%, age 24 - 85 years) whose BCT-IMT data is available in the registry of Okinawa general health maintenance association, between May 2006 and March 2011. BCT-IMT was defined as max-IMT of BCT far wall within visible range or <= 2 cm of aortic side from right common carotid artery branching. We evaluated correlation between BCT-IMT and deep and subcortical white matter hyperintensity (DSWMH).

Results - Both BCT-IMT and DSWMH are related with age, systolic blood pressure, serum total cholesterol, HbA1c and eGFR. DSWMH also related with sex and any smoking history, but BCT-IMT didn’t. Higher levels of BCT-IMT were associated with greater DSWMH (R-square = 0.006, P = 0.005). Multivariate logistic regression analysis indicated that the increase in BCT-IMT per 1 mm was associated with higher prevalence of severe DSWMH (Fazekas grade 3. OR 1.6; 95%CI, 1.0 - 2.5; P < 0.05); especially in age < 60 years (OR 2.1; 95%CI, 1.0 - 4.1; P < 0.05), not in age => 60 years (OR 1.1; 95%CI 0.6 - 2.1; P = 0.7). CCA-max IMT had a similar association (OR 2.2; 95%CI 1.3 - 3.8; P < 0.05); however, there were no significant differences according to age group.

Conclusion - BCT-IMT has a possibility to be useful surrogate marker for a cerebral ischemic change, especially in younger
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Which test should be used to screen for Type 2 Diabetes Mellitus in Acute Ischaemic Stroke?
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Background
Current guidelines from the American Diabetic Association (ADA) recommend the use of HBA1C >6.5% for the diagnosis of T2DM as an acceptable alternative to fasting plasma glucose (FPG) >7.0mmol/L or standard oral glucose tolerance test (OGTT) >11.1mmol/L [1]. This approach has been called into question in patients with acute coronary syndromes [2]. We studied the use of all three tests in diagnosing T2DM in acute ischaemic stroke (AIS).

Methods
Consecutive patients with AIS were included. Patients with a prior history of T2DM or impaired glucose tolerance (IGT) were excluded. All patients were tested for HBA1c, FPG, and OGTT. Cut-off levels for T2DM and IGT were as per ADA criteria [1]. Standard prevalence characteristics were quantified, receiver operator characteristic (ROC) curves were plotted and areas under the curve (AUC) were calculated.

Results
Data from n=56 patients were analysed. The prevalence of newly diagnosed T2DM as per OGTT, HBA1c and FPG was 21%, 0%, and 3.5% respectively (p<0.001). When those newly diagnosed with T2DM were excluded, the prevalence of IGT as per OGTT v HBA1c was 48% v 32% (p<0.001) of the remainder. Standard ROC curves for all 3 tests are shown (see figure). AUC for OGTT, HBA1c, and FPG were 0.89 (p<0.0001), 0.65 (p<0.006), and 0.67 (p<0.005), respectively.

Conclusion
These data highlight the common finding of previously undiagnosed T2DM in AIS and the diagnostic insensitivity of HBA1c and FPG in screening for it. Consideration should be given to the use of the OGTT for T2DM screening in acute ischaemic stroke.

In the year of the catastrophe, occur a significant increase of cases of CVD, 14 in the month previous to the catastrophe, 15 in the month of the catastrophe, and 27 in the month subsequent to the occurrence of the natural disaster.

There was an increase in the number of absolute cases of CVD in periods II and III.

In the year of the disaster, was noted a significant increase in numbers of CVD cases after the first month of the occurrence of natural disaster.

CONCLUSION: From this study we can conclude that there was a statistically significant increase in frequency of cerebrovascular disease after the disaster of November 22, 2008. Among the factors for this increase we can infer the post-traumatic stress syndrome, disruption of a primary care, the interruption of medications and physical exercises in catastrophe periods.

Key words: Natural disaster, catastrophe, cerebrovascular disease.

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CAN THE NATURAL DISASTERS INCREASE THE FREQUENCY OF CASES OF DISEASE CEREBROVASCULAR? A RETROSPECTIVE ANALYSIS IN ITAJAÍ VALLEY – BRAZIL.

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INTRODUCTION: the exposure to the natural disasters is happening more frequently in the world and their importance has been emphasized by their magnitude and their consequences for health. In November 22, 2008 the cities that compose the Itajaí valley, especially the city of Blumenau – Brazil, have been hit by a flood of great proportion associated to landslides.

OBJECTIVE: The aim of this study was verify if there was an increased frequency of CVD after the natural disaster of November 2008 at Santa Isabel hospital in Blumenau – SC. METHODS: Have been selected patients with CVD among all hospitalized patients in HSI in periods: October 22, 2007 to January 22, 2008, period II: October 22, 2008 to January 22, 2009 (period of natural disaster) and period III: October 22, 2009 to 22 January 2010. Have been included only those cases of CVD from the cities of Itajaí valley who declared a state of public calamity and emergency situation at the time of natural disasters that occurred from November 22, 2008. RESULTS: there was an increase in the number of absolute cases along the three periods (32, 56, and 77, respectively).
Meningovascular Syphilis As a Rare Cause of Stroke

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Background: Due to the increasing incidence of syphilis in the early 90s, in recent years, cases of neurosyphilis were more frequent. Meningovascular syphilis, as an evidence of early stage of neurosyphilis, developed in the first five years when after the infection had introduced. It can be a reason for the cerebral stroke.

Methods: During the period from 2008 to 2011 we observed six patients with cerebral stroke, it had been reason as a consequence of syphilitic vasculitis. The diagnosis of neurosyphilis was confirmed by the positive results of blood and CSF on specific and nonspecific antibodies tests, lymphocytic pleocytosis in CSF and increase of protein level in CSF. Age of patients was from 35 to 64 years. All patients had positive the WR and FTA results in the blood and CSF. Cell count in cerebrospinal fluid ranged to 78/1 mcl, and protein to 1.6 g/l. Three patients had as an ischemic stroke in the left middle cerebral artery, in two patients - in the right middle cerebral artery, in one case - in the posterior cerebral artery. Every case was confirmed by neuroimaging. No other causes of stroke, were found by laboratory and instrumental methods were found.

Results: The course of treatment consisted of penicillin intravenously at a dose of 24 million IU per day (4 ml x 6 times a day) for 14 days. Neurological symptoms decreased after the treatment. There lumbar puncture, neuropsychological study, and neuroimaging were carried out in six months again. Cerebrospinal fluid to cleaned off and results of CSF on nonspecific antibodies tests be were negative. Improvement of the results of neuropsychological studies was reported.

Conclusions: Therefore, blood tests and, if it necessary, and cerebrospinal fluid using serological tests for syphilis should be included in a complex study of all stroke patients regardless of age.
shown that polymorphisms of coagulation factor-XIII (FXIII) that stabilizes clots by cross-linking fibrin strands may be markers for genetic susceptibility to intracranial hemorrhage. We explored the association between FXIII activity levels in plasma and hemorrhagic transformation (HT) of acute infarction on the initial brain MRI.

Methods: A cohort of 152 acute ischemic stroke patients (87 men and 65 women; age, 67.9 ± 11.7 years, mean ± SD) was enrolled. All had acute infarct on diffusion-weighted MRI that was performed within 7 days of symptom onset (median = 42 hours). The interval between brain MRI and blood collection for the measurement of FXIII activity did not exceed 3 days (median = 50 hours). A full stroke-related evaluation was conducted on each patient. HT was identified as areas of susceptibility effect on T2* images, without calcification on corresponding CT images.

Results: FXIII levels (% of normal) tended to be lower in patients with HT (57.3 ± 21.9, n = 9) than in those without (77.5 ± 39.9, n = 143), which however did not reach statistical significance (p = 0.135). About one third (n = 44) of the non-HT group patients had FXIII levels higher than 92.2 that was the highest value of the HT group. Large artery atherosclerotic stroke or cardioembolic stroke was more frequent in the HT group (n = 8, 88.9%) than in the non-HT group (n = 52, 36.4%; p = 0.003). NIH stroke scale tended to be higher in the HT group (10.8 ± 9.2) than in the non-HT group (4.7 ± 5.1; p = 0.082). Total white blood cell counts were higher in the HT group (10372 ± 3716 / mm3) than in the non-HT group (8304 ± 2783 / mm3; p =

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**290A** Etiology of stroke and risk factors

**Coagulation Factor-XIII Levels and Hemorrhagic Transformation of Acute Infarction on the Initial Brain MRI**

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Background and Purpose: It has been

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resulting in cognitive and behavioural disturbance.

Case presentation: A 49 year old woman, diagnosed as Basedow’s disease one month before was admitted for marked apathy, memory loss and abnormal behaviour. A frontal lobe syndrome with lack of spontaneous initiative and loss of interest, disorders of attention, orientation and calculation were found, together with diminished verbal fluency and memory impairment. MRI showed bilateral partial infarction in both superficial and deep territory of bilateral ACA and MCA. Multiple intracranial severe stenosis around the circle of Willis were found, without abnormal net-like collateral vessels. There was no biologic evidence of a systemic vasculitis or collagen disease. Results: Clinical state and a follow-up MRI improved with medical control of thyrotoxicosis and antiplatelet treatment.

Conclusion: Thyroid autoimmunity may result in intracerebral stenotic vascular lesions which may have both clinical and imagistical improvement while hyperthyroidism is gradually under control.

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Lisbon, Portugal 2012
Cardioembolic stroke due to AF resulted more often: females (odds ratio, OR=3.90; p<0.001), older (age >60 years: OR=3.75, p=0.04), not affected by hypertension (OR=0.63, p=0.04) or asymptomatic hemodynamic carotid stenosis or occlusion (OR=0.17, p<0.001). Moreover, they were more frequently affected by left-atrial dilation (OR=18.55; p <0.001), cortical-subcortical cerebral ischemic lesion (OR=6.55; p<0.001), ischemic lesions in more than a vascular ground (OR=2.94; p<0.001), spontaneous haemorrhagic transformation of the ischemic lesion (30.4% vs 0.9%, p<0.001). The presence of cortical-subcortical lesion resulted strongly related to cardioembolic stroke also in multiple logistic regression (Nagelkerke R2=0.880; OR=14.07; 95% confidence interval: 3.12-63.50; p=0.001).

Conclusions: The detection of a “cardioembolic profile” in patients with undetermined stroke could encourage further investigations (i.e. loop recorder implantation) to look for paroxysmal atrial fibrillation, refining secondary prevention in such cases.

Intracerebral/subarachnoid haemorrhage and venous diseases

**INTRACEREBRAL HEMORRAGE IN PATIENTS OLDER THAN 70 YEARS IN GREECE: 12 YEARS EXPERIENCE IN A TERTIARY GENERAL HOSPITAL**

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Background: Primary intracerebral hemorrhage (ICH) is one of the common vascular insults with a relatively high rate of mortality. The aims of our study were to examine the demographic and clinical characteristics on 199 patients older than 70 years admitted with intracerebral hemorrhage in Athens, between 1999 through 2010.

Methods: A retrospective study was performed on patients admitted with intracerebral hemorrhage. The following data were recorded: age, sex, season and year of attack, days of hospitalization and outcome.

Results: 52% of patients with intracerebral hemorrhage were men. The mortality rate was 43.2%. The mean age was 68.9 years and the mean period of hospitalization was 19.4 days. The incidence of intracerebral hemorrhage was higher in winter and spring. Not significant correlations were found between season and mortality, sex and year, age and sex and age and days of hospitalization. In contrast, significant correlations were found between year and days of hospitalization ($r = 0.57; p<0.01$) and between year and age ($r = 0.158; p<0.05$).

Conclusion: Episodes involving patients older than 75 years and prolonged length of hospital stay were increased over the last 12 years.

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Biomarkers of the blood brain barrier (BBB) disruption in course of the spontaneous intracerebral hemorrhage (SICH).
whereas TIMP-2 was peaked on day 3. Only MMP-9 and TIMPs levels tended to be higher than in controls during the whole period.

Conclusion: BBB disruption biomarkers profile changes over the first one week after SICH onset and seem to be related to the development of hematoma and perihematomal changes.

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**Steroid-responsive Late Symptomatic Perihematomal Edema In Intracerebral Haemorrhages**

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Background: Intracerebral hemorrhage (ICH) is the most devastating subtype of stroke, causing high mortality, morbidity and disability. While the evolution of mass effect after cerebral infarction is relatively well characterized, there is only limited knowledge about perihematomal edema in ICH which develops at 2 distinct time points: within 2 days, associated with hematoma enlargement and in the second or third weeks, simultaneously with hematoma resorption. The clinical significance and treatment of later developing edema in ICH is unclear.

Cases and results: Out of 99 consecutive ICH patients prospectively registered to Florence Nightingale Stroke Database between March 2005 and December 2011, we present 3 patients (3.03%) with clinical deterioration due to late perihematomal edema. They were aged 55 to 76 years, and showed a slow and progressive decline of consciousness and initial focal neurological deficits that was detected 12 to 20 days later after onset. Their diagnoses were hypertensive left putaminal hematomas in 2 patients and right frontal lobar hematoma due to cerebral amyloid angiopathy in the other. All patients showed remarkably large perihematomal edema in cerebral tomography and/or magnetic resonance imaging compared to baseline neuroimaging studies. Late edema developed despite reduction in hematoma volume either spontaneously or surgically. Initiating steroid therapy resulted in prompt clinical and radiological regression in a few days in all patients.

Conclusion: To our knowledge, this is the first study that reports steroid responsive symptomatic late perihematomal edema in cases of ICH. In our database the incidence of this type of perihematomal edema is 3.03%. Dramatic responses to steroid in our patients suggest a late developing vaso-genic edema.
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Case report: A young patient with multiple intracerebral hemorrhage

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INTRODUCTION: Cerebral amyloid angiopathy (CAA) refers to deposition of β-amyloid in the walls of small vessels in the central nervous system. Sporadic CAA mostly occurs in the elderly and its severity is age related. We can not make a clinical diagnosis of sporadic CAA in patients younger than 55 due to Boston’s clinical criteria for CAA. CASE REPORT: A 46-year-old nonhypertensive man was hospitalised at our clinic in year 2009 because of ICH in right parietal lobe. Computed tomography angiography (CTA), digital subtraction angiography (DSA) did not reveal any vessel pathology. Magnetic resonance imaging (MRI) showed subcortical ICH in right parietal lobe and multiple small ischemic strokes in both hemispheres. He had no coagulopathy, rheumatic tests were negative. In July 2011 he experienced headache with mild right-sided hemiparesis. CT showed acute subcortical ICH in left frontal lobe. CTA and DSA were negative again. Neuropsychological testing showed diffuse cortical cognitive impairment. Control MRI after four months showed atrophy in right parietal, left frontal lobe and multiple chronic small ischemic strokes in both hemispheres. The examination of cerebrospinal fluid (CSF) showed raised protein content and lower levels of β-amyloid. DISCUSSION: Sporadic CAA is an important cause of ICH in the elderly. The Boston’s clinical criteria of CAA a priori exclude patients who are younger than 55 years. There are no pathognomonic clinical features of CAA related ICH and definitive diagnosis requires histologic examination of brain tissue. To confirm probable CAA during life Gradient echo MRI has been proven to be useful. Despite no ordinary risk factors, our patient suffered multiple lobar ICHs. Radiological, neuropsychological and CSF tests favoure the CAA diagnosis. Because patient’s family history is negative for ICH and Alzheimer’s dementia, we concluded he has a probable sporadic CAA angiopathy. CONCLUSION: We believe that sporadic CAA is not exclusively the disease of elderly. Although we did not obtain brain tissue biopsy, clinical features and tests results allow us to conclude, that our patient inspite his age has a CAA related ICHs.

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Is cisternal drainage required for the prevention of symptomatic vasospasm after surgery for ruptured intracranial aneurysm?

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Background: Cisternal drainage has been used widely to prevent symptomatic vasospasm (SVS) after surgical clipping of rup-
considered that cisternal drainage might not be essential, at least for patients classified into Fisher CT group 2 or patients with ruptured aneurysm of the anterior cerebral artery.

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On admission anemia is an independent predictor of unfavorable functional outcome in spontaneous intracerebral hemorrhage

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Background and Objective
On admission anemia is an independent predictor of unfavorable functional outcome in spontaneous intracerebral hemorrhage. On admission anemia [OAA] was associated with larger hematoma volume and lower hemoglobin levels during hospital stay were related to poorer outcome. It remains unknown whether anemia impacts outcome primarily through its effects on ICH volume or itself has independent effects.

Methods
This retrospective analysis included 174 consecutive patients with spontaneous supratentorial intracerebral hemorrhage. Clinical data including the pre-admission-status, neuroradiological, initial presentation, treatment, and outcome were evaluated through institutional databases, patient’s medical charts and by mailed questionnaires. Logistic regression analyses were calculated
to evaluate associations of OAA with functional outcome and to determine independent effects of OAA.

Results

OAA was associated with larger ICH volume (29.9 cm³ versus 13.6 cm³, p=0.001), greater extent of IVH (p=0.044) and poorer neurological status on admission (p<0.001). Further, OAA showed a true positive and accurate association with larger hemorrhage volumes (ROC: p=0.001, AUC>0.7). Multivariately, for all patients OAA was an independent predictor of unfavorable functional outcome (mRS>3) at 90 days (OR=3.179; p=0.0435). In OAA patients no independent predictor could be elucidated, whereas in non-OAA patients ICH volume demonstrated known independent effects on functional outcome (OR 1.05; p=0.031).

Conclusion

OAA is a predictor of an unfavorable functional outcome and has independent effects beyond its association with larger hemorrhage volumes. OAA appears to be a previously unrecognised outcome predictor. Its treatment could possibly open up new therapeutic avenues to decrease the rate of functionally dependent patients after ICH.

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A pragmatic diagnostic algorithm to detect acutely treatment-relevant underlying pathologies (ATRUP) in patients with spontaneous intracerebral hemorrhage.

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Background: Intracerebral hemorrhage (ICH) is the deadliest form of stroke, but the diagnostic work-up has only been insufficiently defined. We tested the impact of a pragmatic step-wise diagnostic algorithm including CT/CTA, MRI/MRA, and digital subtraction angiography (DSA) on the detection of acutely treatment-relevant underlying pathologies (ATRUP).

Patients and Methods: We analyzed 81 consecutive patients (51% women, mean age 64 years +/-12) hospitalized for spontaneous ICH. All patients had initial CT with or without CTA. Those without evident underlying cause and no contraindication underwent MRI/MRA. Finally, diagnostic DSA was performed in cases without evident ICH etiology on prior imaging.

Results: Of the 81 ICH patients, 3 (4%) showed deep ICH with CT evidence of severe small vessel disease. In one case (1%), CTA revealed cerebral venous thrombosis. The remaining 76 (94%) patients without contraindication (n=1 had a pacemaker) underwent subsequent MRI/MRA allowing detection of an underlying pathology in 50 (62%), including 6 (7%) with ATRUP: one patient had acute cerebral venous thrombosis, two had secondary hemorrhagic infarcts, two showed cavernous malformations, and one an underlying glioblastoma.

Conclusion

OAA is a predictor of an unfavorable functional outcome and has independent effects beyond its association with larger hemorrhage volumes. OAA appears to be a previously unrecognised outcome predictor. Its treatment could possibly open up new therapeutic avenues to decrease the rate of functionally dependent patients after ICH.
Background and purpose: The efficacy of cerebrospinal fluid shunting to reduce intracranial hypertension and prevent fatal brain herniation in acute cerebral vein and dural sinus thrombosis (CVT) is unknown. Method: From the cohort study ISCVT and a systematic literature review we retrieved acute CVT patients treated with shunting (external ventricular drain, a ventriculoperitoneal or a ventriculojugular shunt) except lumbo-peritoneal shunt. Outcome was classified at 6 months and final follow up by the modified Rankin Scale (mRS). Results: 21 patients were collected (10 from ISCVT and 11 from the review) who were treated with an external ventricular drain (9 patients), a ventriculoperitoneal (11 patients) or a ventriculojugular shunt (1). Eleven patients (53%) regained independence (mRS 0-2), while 7 patients (33%) developed a severe handicap (mRS 4-5) and 5 (24%) died despite treatment. Presentation as isolated intracranial hypertension syndrome (ICH) was associated with a trend to a good outcome: 4 (66%) of patients with ICH had complete recovery (mRS 0-1) (p=0.06). Patients with GSC<9 had a trend towards a worse outcome:3/5 (63 %) were death or dependent as opposed to 6/16 (37.5%) of the patients with a GSC≥ 9 (p=0.07). Two out of 3 (67%) patients with deep venous system thrombosis died despite shunting. 6 patients had hydrocephalus. Only one of them was independent, 3 were dependent and 2 (33%) died. 13 patients had hemorrhagic lesion: 6 were independent, 4 were dependent and 3 died. Conclusion and implications: More than half of acute CVT patients treated with shunt regained independence but mortality was high. With the

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SHUNTING IN ACUTE CEREBRAL VENOUS THROMBOSIS
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Results
Except for one case, no one had an episodic headache history. Thirteen cases had a headache besides the all preceded ONP. Ten of whom experienced a pain around orbital region in 9 IC-Pcom and 1 IC-Acho, two of whom had dull headache in 1 giant BA-SCA and 1 BA bifurcation and one of whom had details unknown headache in 1 BA-SCA. Four cases had no episode of a headache in 1 IC-Pcom, 2 large IC-Pcom and 1 IC-Acho. Although it took 11.2 days from onset of a headache to ONP, it was only 6.1 days especially in the cases with an orbital pain. The typical characteristics of an orbital pain were sharp pain to disturb a sleep, no effect on analgesic and sudden onset. In 6 cases performed clipping, very thinner aneurysmal walls about to rupture were observed without exceptions.

Conclusion
In cases of IC-Pcom and IC-Acho with a diameter of 12 mm less, an orbital pain trended to precede ONP. Since no headache was observed in 2 large IC-Pcom seemed to grow gradually, the pain especially in orbital region may relate in the stimulus to just local tent edge due to the abrupt growth of aneurysm and in the vascular pain itself by aneurysmal wall dilatation. There was a possibility that the pain-generating mechanism of an orbital pain in this series may be similar with it of cluster headache presenting a typical orbital pain, which is considered the origin of pain in internal carotid artery near the cavernous sinus.

limitation of low nº of patients, shunted patients with ICH had a trend to a better prognosis. Although shunts are sometimes used for patients with impending herniation, shunting does not appear to be effective in preventing death.

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Features of the headache secondary to unruptured intracranial aneurysm with oculomotor nerve paresis
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Background
The symptoms of unruptured intracranial aneurysms (UIA) may be shown the oculomotor nerve paresis (ONP). Those cases should be treated immediately as an impending rupture. We evaluated the headache secondary to UIA with ONP.

Methods
Seventeen cases of UIA with ONP were examined. All cases were treated surgically to prevent the rupture by 6 clipping, 9 IVR, 1 bypass-parent artery occlusion and 1 bypass+IVR. The localizations of aneurysms were as follows, 12 IC-Pcom, 2 IC-Acho, 2 BA-SCA and 1 BA bifurcation, including 2 large IC-PC and 1 giant BA-SCA.
Challenges in neurointervention: the importance of a multi-disciplinary approach.

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Introduction:
Whilst new neurointerventional treatment approaches offer considerable improvements in patient management, they also present new challenges and highlight the importance of a multi-specialty approach. Here we present one illustrative case.

Methods and results:
A 46-year-old lady with grade III subarachnoid haemorrhage was found to have a symptomatic wide-necked basilar aneurysm on CT angiography with MCA branches arising very close to the aneurismal neck. A small left MCA bifurcation was also identified. The right MCA aneurysm was treated with balloon assisted coil embolisation, the base of the aneurysm being intentionally left open to prevent occlusion of right MCA branches, with further interval treatment planned. Radiological vasospasm of MCA branches was treated with Abciximab (glycoprotein IIb/IIIa receptor antagonist) infusion. Early post-procedural transient episodes of left arm weakness and sensory disturbance (at 8 days) were attributed to vasospasm, prompting single and later dual antiplatelet therapy.

Conclusion: Such a case, together with others to be presented and supported by appropriate imaging, serve to highlight various areas of uncertainty, such as selection of endovascular intervention, management of vasospasm, and the timing and choice of antiplatelet therapy for thromboembolic complications. Close multi-specialty working between neurology, Intensive care physicians, neurosurgery, and interventional neuroradiology is likely to be increasingly important for the optimal management of such patients.

External validation of the Secondary Intracerebral Hemorrhage (SICH) score in Dutch patients with intracerebral haemorrhage

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Background. In a considerable proportion of patients with intracerebral haemorrhage (ICH) an underlying vascular cause is identified, which has important therapeutic and prognostic consequences. Recently a scoring system has been developed to predict the probability of harbouring underlying vascular aetiology. This Secondary Intracerebral Hemorrhage (SICH) score includes four variables (age, sex, history of hypertension or impaired coagulation, and non-contrast CT scan (NCCT) evaluation). We assessed the external validation of the SICH score.
Methods. We included all patients with non-traumatic ICH who had been admitted to our hospital between February 2003 and May 2011 and in whom at least one angiographic examination, haematoma evacuation, brain biopsy or autopsy was performed. We reviewed medical records for age, sex and history of hypertension or impaired coagulation. Two independent observers scored the admission NCCT as low, indeterminate or high risk of finding underlying vascular pathology as cause of the ICH. Performance of the SICH score was assessed by calibration (agreement between observed and predicted outcomes) and discrimination (separation of those with and without vascular aetiology).

Results. Compared with the derivation cohort, underlying vascular aetiology was more often observed in the validation cohort (15% vs. 25%). The validation cohort contained fewer females (46% vs. 41%) and fewer patients with hypertension or impaired coagulation (67% vs. 48%), average age was lower (65 vs. 57 years). The SICH score showed a modest discriminative ability with a c-statistic of 0.73 (95% CI 0.65-0.80) and the calibration was reasonably good. The discriminative ability improved if only NCCT categorization was included in the SICH score (c-statistic 0.79 (95% CI 0.72-0.86)).

Conclusion. The discriminative ability of the SICH score is moderate. To enhance the prediction of an underlying vascular aetiology in patients with ICH, this score should be revised.

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New Prognostic Score for the Prediction of 30-day Outcome in Spontaneous Supratentorial Cerebral Hemorrhage

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Background and Purpose – the purpose of the present study was to evaluate predictors of outcome in primary supratentorial cerebral hemorrhage. Furthermore, we aimed to develop a prognostic model to predict 30-day fatality.

Methods – We retrospectively analyzed a database of 156 patients with spontaneous supratentorial hemorrhage to explore the relationship between anamnestic, clinical and CT characteristics, and fatal outcome within 30 days using multiple logistic regression analysis. Fifty nine non-survivor and 66 survivor patients. All non-survivor pts. were autopsied and postmortem clot volume, clot/brain ratios, locations etc.
were analyzed and compared with in vivo images. The analyzed factors included volumetric data assessed by neuropathological and CT volumetry. A second CT scan in survivors, or neuropathological ABC/2 volumetry in non-survivors was used along with the baseline CT to assess the growth index of hematoma.

Results – Ischemic heart disease, systolic blood pressure, serum potassium and glucose levels, platelet count, absolute and relative hematoma volumes, presence and size of intraventricular hemorrhage, and right-sided location statistically significantly predicted the fatal outcome within 30 days. Based on our results we formulated a six-factor scoring algorithm named SUSPEKT to predict the outcome.

Conclusions – After validation the SUSPEKT Score may be applicable in general clinical practice for early patient selection to optimize individual management or for assessment of eligibility for treatment trials.

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Gonadotropin deficiency after subarachnoid hemorrhage (SAH)
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Background: Recent studies have shown a high frequency of hypopituitarism after SAH. To evaluate the role of gonadotropin in menopausal symptoms, we compared menopausal symptoms in SAH patients with and without gonadotropin deficiency. We attempted to identify neurologic parameters, which predict gonadotropin deficiency after SAH.

Methods: The data are a part of the HIPSS, an ongoing prospective cohort study of SAH patients. We examined 20 postmenopausal women. Serum FSH and LH levels were measured after discharge from ICU, 12, 24 and 60 weeks after SAH. Postmenopausal symptoms were measured with the “Green Climacteric Scale”. We compared results of gonadotropin-deficient and non-gonadotropin-deficient subjects with a control-group of healthy postmenopausal women.

Results: Gonadotropin deficiency occurred in 14 (70%) of 20 postmenopausal women in the acute phase after SAH. It persisted in 4 out of 12 (30%) of patients 24 weeks after SAH. Eight patients did not complete the follow up. Gonadotropin deficient patients were older (mean age 64.4 vs 56.3). There was a trend towards more severe SAH characteristics and complications, a longer duration of primary hospital stay (20.4 vs 15.4 days), WFNS grade (grade III, IV or V: 5 vs 2), delayed cerebral ischemia (6 vs 1) and rebleed (2 vs 0) in gonadotropin deficient patients, but this was not statistically significant. The score on the Green Climacteric Scale did not differ between groups.

Conclusions: Gonadotropin deficiency in postmenopausal women after SAH is associated with older age. We did not find clear influence of gonadotropin deficiency on postmenopausal symptoms in this preliminary study. Gonadotropin deficient patients seem to have had a more severe SAH.
Serial volume measurements of hyper-acute Intracerebral Haematomas by Transcranial Ultrasound. Preliminary results from a cohort study
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Background:
Haematoma expansion and neurological deterioration occur in more than 30% of patients with intracerebral haematomas (ICH) during the first hours after symptom onset. Aim of study is to describe the time course of haematoma expansion as measured by transcranial ultrasound (TCU) and its relations to systemic blood pressure, spot-sign, post-contrast extravasation as well as neurological deterioration.

Methods:
Patients admitted with primary ICH within 4.5 hours after symptoms onset are eligible for inclusion. On admission, a non-contrast computed tomography (CT) and a CT angiography are performed routinely. TCU is used in measuring haematoma volume: during the first 6 hours every 30 minutes and from 6 – 12 hours every 2 hours. Blood pressure, heart rate, neurological status (National Institute of Health Stroke Scale) are recorded at the same time intervals. Final endpoint is haematoma volume on control CTC after 24 hours or death within 24 hours. Thirty patients will be included. The Scientific Ethic’s Committee of the Capitol Region of Denmark has approved the study.

Results:
14 patients have been included from 1 September 2011 to 1 January 2012. 8 were observed according to protocol; 1 underwent immediate surgical evacuation, 1 had a poor bone window, in 4 patients, the haematoma was not to be visualized. Mean delay to inclusion was 2h, 50min after symptom onset. Three patients had spots-sign on admission CTA, and haematoma growth was observed with 2 of these patients. One patient expanded from an admission volume of 4,7cm³ to 81,8cm³ and one from 6,5cm³ to a volume of 58,9cm³ with a stepwise development. Overall correlation between CT and TCU volume; r = 0.850 (Spearmans rho), (p=0.004).

Conclusion:
TCU monitoring is feasible in patients with acute ICH depending on anatomical location and bone window. TCU volume measurements correlate well with CT. TCU may prove a useful tool in documenting mechanisms of haematoma growth in human ICH.
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**Predicting vasospasm in patients with subarachnoid hemorrhage (SAH): a novel scoring system**

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Background: Disability in SAH affects half of survivors and is frequently caused by ischemic injury related to vasospasm. Reliable risk prediction might allow prevention or earlier treatment of vasospasm and reduce morbidity.

Methods: We retrospectively reviewed consecutive patients with aneurysmal SAH admitted to our institution from August 2006 to June 2010. We collected data on patient demographics, admission laboratory and test results, clinical and radiographic features, aneurysm treatment, and vasospasm occurrence. We excluded patients without 1) TCD within 48 hours of admission, and/or 2) survival to 7 days minimum. Symptomatic vasospasm was defined as clinical deterioration with angiographic vasospasm. A weighted risk score from 0-17 was created using a multivariable logistic regression.
model and analyzed as a prediction tool for symptomatic MCA vasospasm using receiver operating characteristics (ROC) analysis.

Results: Two-hundred eleven patients were included (mean age 54.7 years; 69.2% female; 22.7% symptomatic MCA vasospasm). Eight factors predicted symptomatic vasospasm and were used to derive a vasospasm risk score (acronym SAH WATCH): Sex (female: 2 pts), Age (< 60 years: 2 pts), initial HH score (4-5: 2 pts, 3: 1 pt), admission White blood cell count (WBC) (> 16,000: 3 pt), Aneurysm location (anterior circulation: 1 pt), MCA mean flow velocity by initial TCD (> 80 cm/s: 3 pts), Clipping (1 pt), and blood on Head CT by modified Fisher scale (3 or 4: 3 pts). On ROC analysis, the score had excellent discrimination (c-statistic 0.82, 95% CI 0.76-0.88). A simplified version with 4 groups also performed well (c-statistic 0.79, 95% CI 0.73-0.86): group 1-1.2%; 2-4.8%; 3-17.4%; 4-46.9% predicted risks.

Conclusions: The SAH WATCH score is easy to calculate and reliably predicts symptomatic MCA vasospasm. If externally validated, it may serve to select patients for early intervention or potential enrollment in clinical trials for treatment of vasospasm.

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**Clinical features, management and prognosis of intracerebral haemorrhage associated to oral anticoagulants**

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Baseline INR was 2.7 (0.9 – 10.8), after treatment: 1.3 (1-6) [median (range)]. Volume of haematoma on baseline CT was 26±31 cc and on follow-up CT: 36 +/- 42 cc. Death or dependency at three months was 78.6%. Comparing treated with no treated patients, NIHSS at 7th day was was 9 (2; 20) vs 4.5 (0; 8.25) [median (p25; p75)] (p=0.2) hematoma growth occurred in 44% vs 50% (p=0.4), independency (mRS 0-2) in 20% vs 28.6% (p=0.6) and mortality in 43% vs 28.6% (p=0.7)

Conclusion
ICH-OA have a poor prognosis with high rates of mortality and dependency. INR correction does not appear to modify outcome. More studies are necessary to confirm these findings and to establish prognostic factors and best treatment protocols.

Background and aims
Correction of the International Normalized Ratio (INR) is recommended for patients with intracerebral haemorrhage associated to oral anticoagulants (IH-OA). However the efficacy of treatment regarding outcome is not well established. We describe clinical features and management of IH-OA as well as outcome related to treatment.

Methods
Observational study from a prospective multicentered registry of all patients admitted with an IH-OA. Baseline characteristics, risk factors, time-lapse to treatment, treatment applied, baseline and post-treatment INR were recorded. Principal variables were haematoma growth, outcome (NIHSS at 7th day and mRs at 3 months) and mortality. Effect of treatment on principal variables was analyzed.

Results
51 patients were included; age 75 +/- 11 years, 57% males; baseline NIHSS: 11(4.75; 20) [median (p25; p75). 82% received treatment for INR correction with a mean delay from symptom onset of 13.7 +/- 21.6 h; decision to treat was related to INR. Most patients received vit K together with prothrombin complex concentrate.
Gender differences are well described for patients with ischemic stroke. Conversely, for patients with intracerebral hemorrhage (ICH), sex disparities in stroke presentation, risk factors, and outcomes were not well studied. Our objective was to compare the clinical characteristics, management patterns and outcomes between genders for patients with ICH in Fortaleza-CE, Brazil. Methods: Data were prospectively collected from patients admitted to 19 hospitals in Fortaleza with ICH diagnosed by trained research coordinators from June-2009 to October-2010. All patients admitted with a diagnosis of ICH were prospectively evaluated. A nurse coordinator reviewed all the patients. Results: We evaluated 364 patients, 48.1% were women. Men were younger (59.3 yo ±14.58 vs 66.3±14.6 yo, p<0.001), more frequently smokers (33.1% vs 16.6%, p<0.01) and had a higher frequency of alcohol abuse (48.5% vs 8.2% p<0.01) as compared to women. Women had a trend to have more dyslipidemia (41.1% vs 31.3%, p=0.12). Clinical presentation was similar between genders, except for a higher frequency of speech disturbances in men (63.6% vs 52.7%, p=0.04). The time interval from symptoms onset to hospital admission was higher in women (25.1± 82.4 h vs 7.9±50.3 h, p=0.08). Complication rates including pneumonia and deep venous thrombosis were similar between genders. Mortality was similar in both sexes (females: 35.8% vs males: 33%, p=0.66). Men were more frequently independent at discharge when evaluated by the modified Rankin scale scores (mRs) (mRs ≤ 2: 19.7% vs 8.1% in women, p<0.01). Conclusion: Overall, risk factors for ICH in men and women were similar in our series. Men had a higher frequency of alcohol abuse, smoking, and speech disturbances. Women were older, had an increased time length from symptoms onset to hospital admission and had a worse prognosis at discharge. Better understanding of the gender disparities in ICH will hopefully lead to better outcomes in both sexes in the future.

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Depressive symptoms and anxiety up to three years after Subarachnoid Haemorrhage: prevalence and prediction

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Background: Depressive symptoms and anxiety after subarachnoid haemorrhage (SAH) have negative influence on quality of life. We analysed the course of depressive symptoms and anxiety up to 3 years after SAH and developed a prediction model at 3 months after SAH for depressive symptoms and anxiety on the long term.
Methods: Longitudinal follow-up study. We included patients with a SAH, who were discharged home and visited the outpatient clinic 3 months after the SAH (N = 143) and returned questionnaires 1 year (N = 113) and 3 years after SAH (N = 93). The Beck Depression Inventory (BDI) and the State-Trait Anxiety Inventory (STAI) were used at 3 months, 1 year, and 3 years after SAH. Possible predictors were; demographic variables (age, sex, education), SAH characteristics (location of aneurysm, complications like delayed cerebral ischemia or hydrocephalus and GOS), psychological characteristics (cognitive symptoms, coping, depressive symptoms and anxiety). We used bivariate and backward logistic regression analyses to predict (at 3 months) depressive symptoms and anxiety 1 and 3 years after SAH.

Results: Depressive symptoms were present in 39.4% (3 months), 40.6% (1 year) and 54.1% (3 years) of the patients and anxiety in 51.5%, 47.9% and 53.2%. The most important of the significant predictors of depressive symptoms 1 year after SAH were passive coping, depressive symptoms and GOS (explained variance 52%) and of depressive symptoms 3 years after SAH passive coping and GOS (explained variance 25%). The most important predictors for anxiety 1 year after SAH were depressive symptoms and anxiety (explained variance 43%) and for anxiety 3 years after SAH passive coping (explained variance 21%).

Conclusion: There is a high prevalence of depressive symptoms and anxiety in the years after SAH, for which psychological variables and the GOS are predictors. These findings highlight the possible value of psychological interventions in patients with SAH.

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Nimodipine treatment after subarachnoid haemorrhage has a gender specific effect and improves outcome only in female patients

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Background: Nimodipine is the only medical treatment shown to improve outcome after subarachnoid hemorrhage (SAH). This effect is thought to be based on prevention of delayed cerebral ischemia, a common complication after SAH. Its working mech-
anism is not understood; once thought to prevent vasospasm, a neuroprotective and fibrinolytic effect has been proposed more recently. Since sex influences fibrinolysis, we aimed to evaluate a possible gender-specific effect of nimodipine.

Methods: We contacted all authors of randomized placebo-controlled trials included in the Cochrane review on nimodipine after SAH. We included data on mode of treatment, gender, age, Glasgow Coma Scale at admission, history of hypertension, occurrence of rebleeding, outcome (Glasgow Outcome Scale) after three months, and occurrence of cerebral infarction. Cause of poor outcome (primary bleeding, rebleeding, or ischemia) was reconstructed. Statistical analysis was performed by gender on the studies separately and on the pooled data. In addition, the data was reanalyzed by different age categories.

Results: Two studies were included totaling 809 patients (75% of data included in Cochrane review). Neither in the studies separately nor in the pooled data was outcome different between males treated with or without nimodipine, while outcome improved in females treated with nimodipine (pooled: men OR 0.97, 95% CI 0.59 – 1.59, women OR 2.34, 95% CI 1.54 – 3.55). Analysis of interaction showed an absolute difference in ORs between females and males (0.88, 95% CI 0.23 – 1.53, p=0.008). In females all causes of poor outcome were reduced by nimodipine treatment. Adjustment of ORs for known predictors of poor outcome did not change the results. Analysis in different age categories had the same results.

Conclusion: This post-hoc analysis on nimodipine use after SAH shows a clear gender-specific effect. This finding could lead to the development of more tailored treatment strategies in patients with SAH.

<table>
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<th>Subgroup/Study</th>
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<th>Odds ratio, 95% CI</th>
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<tr>
<td>Öhman 1988</td>
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<td>1.21 [0.63, 2.32]</td>
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<td>Pickard 1989</td>
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<tr>
<td>Subtotal (95% CI)</td>
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<tr>
<td><strong>Female</strong></td>
<td></td>
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<tr>
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<td>1.74 [0.78, 3.88]</td>
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<tr>
<td>Pickard 1989</td>
<td>2.61 [1.60, 4.26]</td>
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<tr>
<td>Subtotal (95% CI)</td>
<td>2.34 [1.54, 3.55]</td>
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Heavy alcohol intake and intra-cerebral haemorrhage: characteristics and impact on outcome

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Background: we aimed to identify associated factors and influence on long term outcome of heavy alcohol intake in a large prospective cohort of consecutive spontaneous intracerebral haemorrhage (ICH) patients.

Methods: between 11/04 and 03/09, we prospectively recruited 562 consecutive adults with a spontaneous ICH. We excluded patients without information on drinking habit (n=22). Heavy alcohol intake was defined as a regular consumption over 300 grams of alcohol per week. We performed
bivariate and multivariate analyses (logistic regression) based on demographic and radiological models. Survival analyses were performed using Kaplan-Meier statistics. Results: among 540 ICH patients, 137 (25%) were heavy alcohol drinkers [median age: 60 versus 74 years in non abusers (p<0.0001)]. Factors independently associated with heavy alcohol intake in the demographic model were: younger age (OR=0.97 per 1 year increase; 95%CI 0.95-0.98), smoking habit (OR=3.96; 95%CI 2.43-6.46), ischaemic heart disease (OR=0.34; 95%CI 0.15-0.77). In the radiological model, independent factors were non lobar location of ICH (OR=1.71; 95%CI 1.05-2.77) and less severe leukoaraiosis (OR=0.76; per 1 step increase, 95%CI 0.62-0.73). Platelet counts and prothrombin ratio were significantly lower among heavy alcohol drinkers (respectively p=0.01, p=0.017). Heavy alcohol intake was predictive of 2 years mortality only among patients younger than 60 years with non lobar ICH (OR=1.96; 95%CI 1.06-3.63).

Conclusion: heavy alcohol intake is associated with the occurrence of ICH at a young age. However, the underlying vasculopathy remains unexplored in these patients. Indirect markers suggest small-vessel disease at an early stage that might be enhanced by moderate hemostasis disorders.

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Reversal, resumption and discontinuation of anticoagulant therapy after warfarin-related intracerebral hemorrhage:


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Background: Because intracerebral hemorrhage (ICH) during oral anticoagulation (OAC) has a high risk of ongoing bleeding and death, urgent coagulopathy reversal should be considered. Meanwhile, reversal or withholding of OAC has a potential risk of thromboembolism. We examined the impact of reversal, resumption and discontinuation of OAC on ICH outcomes.
Methods: A multicenter, prospective, observational study was conducted. Acute OAT-ICH patients who were admitted within 3 days after onset were enrolled and followed up during 3 months.

Results: We registered 52 patients with OAC-ICH (18 women, 73±9 years old, median NIHSS 9, median INR 2.02). Coagulopathy was reversed in 44 patients (85%), using vitamin K in 24, plasma derivatives in 2, and both in 18 patients. OAC was resumed in 37 patients (71%) at the fifth day in median. Of these, one patient who received OAC again at the 5th day showed hematoma growth thereafter. During 3 months, bleeding complications occurred in 1 patient who discontinued OAC (GI bleeding) and 4 patients who resumed OAC (2 recurrent ICH, 1 GI bleeding, 1 severe epistaxis). Meanwhile, thromboembolic complications were observed in 3 patients discontinuing OAC (1 stroke, 1 pulmonary embolism, 1 myocardial infarction) and 6 patients resuming OAC (1 stroke, 3DVT, 1 intracardiac thrombus, 1 systemic embolism); of these, 5 events occurred before resumption and 1 occurred 2 days after resumption. At 3 months, 14 patients (27%) had mRS 0-1, to which lower initial NIHSS was independently related (OR 1.24, 95%CI 1.08-1.53 per 1-point); 13 (25%) had mRS 5-6, to which discontinuation of OAC was independently related (OR 6.73, 95%CI 1.17-43.80).

Conclusion: In acute OAC-ICH, coagulopathy was reversed in 85% of patients and OAC was resumed in 71%. Bleeding complications occurred in 5 patients (10%) and thromboembolic complications occurred in 9 (18%) during 3 months. Discontinuation of OAC was related to unfavorable outcome.

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Comparison of methods for measuring intracerebral haemorrhage volume: data from the ‘Efficacy of Nitric Oxide in Stroke’ (ENOS) trial

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Background: Several methods are available for measuring spontaneous intracerebral haemorrhage (ICH) volume. It is unclear which is most reliable.

Methods: We analysed brain scan data on 301 patients with primary ICH from the ongoing ‘Efficacy of Nitric Oxide in Stroke’ (ENOS) trial. ICH volume was measured using three methods: ABC/2 formula and semi-automatic segmentation (SAS) with OsiriX software (v3.9); and visual estimation of the longest ICH diameter by independent neuroradiologist during systematic scan adjudication. We compared ABC/2
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Clinical outcome six months after cerebral venous thrombosis: which factors are involved?
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Background: Patients with cerebral venous thrombosis (CVT) usually have a good outcome, but late complications, permanent disability or death may occur. Our aim was to identify, in our tertiary hospital and in the last 5.5 years, clinical/imaging factors that influence outcome of patients with CVT, six months after admission.

Methods: Retrospective study; clinical/imaging data collected from medical records of adult patients with CVT admitted between January 2006-June 2011 at admission, discharge and 6 months. Statistical analysis performed with SPSS V20.0.0 (p<0.05).

Results: 66 patients, 82% women, mean age: 39.9 years. 9 patients lost for follow-up (13.6%). Median admission at 6 months NIHSS: 0 (AIQ 25-75%, minimum 0, maximum 18 and 6, respectively). Patients with mRs>2 at discharge were 10.9% and at 6 months 3.5%. Mortality 0%. NIHSS>3 and mRs>2 at 6 months were associated with age over 45 years (p=0.027) and hemorrhage as an initial CVT presentation (p=0.000). At 6 months there was no evidence of recanalization in 11.1%, and it was complete in 29.6%. Chronic headache was the most common complication (18.7%), followed by depression (6.8%), epilepsy (5%) and dural arteriovenous fistula (DAVF) (5%). Failure of recanalization was associated with development of DAVF (p = 0.003). Although 29% had papilledema...
at admission at 6 months, only 1.7% had diminished visual acuity. There was no significant relationship between NIHSS, mRs and recanalization status at 6 months and gender, time to diagnosis, venous infarction, location of CVT, risk factors or others late complications.

Conclusion: Hemorrhage as an initial manifestation of CVT and age > 45 years were associated with worse functional recovery. There was no DAVF in patients with complete recanalization, supporting its pathophysiology. Clinical outcome at six months was better than previously reported in the literature, likely reflecting improvement of medical care/rehabilitation.

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Scalp electroencephalographic (EEG) correlates of spreading depolarization in patients with hemorrhagic and ischemic stroke

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Background Spreading depolarization (SD) is a mechanism of massive ion translocation causing cytotoxic edema. Dependent on the energy status, SD is either preceded by non-spreading silencing due to neuronal hyperpolarization or accompanied by spreading silencing of brain electrical activity due to a depolarization block. Non-spreading silencing seems to translate into the initial clinical symptoms of ischemic stroke and spreading silencing into migraine aura. SDs facilitate neuron death when they invade metabolically compromised tissue whereas they are relatively innocuous in healthy tissue. Electrophysiological evidence exists that SDs occur abundantly in aneurismal subarachnoid hemorrhage (aSAH) and malignant hemispheric stroke (MHS). For a long time, it was believed that the scalp EEG shows no signs of SDs in these patients.

Methods In 5 aSAH and 4 MHS patients, we performed simultaneously EEG at the scalp and electrocorticography (ECoG) at the cortical surface.

Results After aSAH, 275 slow potential changes (SPCs), identifying SDs, were recorded by ECoG during 694 hours. Visual inspection of time-compressed scalp EEG identified 193 (70.2%) SPCs (ECoG-EEG delay 1.8 (0.8, 3.5) min). Intervals between successive SDs were significantly shorter for depolarizations with EEG-identified SPC. EEG was thus more likely to display SPCs of clustered than isolated SDs. In 2 of 5 aSAH patients, serial magnetic resonance imaging revealed delayed infarcts while ECoG showed clusters of SDs with persistent depression of spontaneous activity. Alternating current EEG similarly displayed persistent depression of spontaneous activity, and direct current EEG SPCs riding on a shallow negative ultraslow potential. Fewer SDs were recorded in patients with MHS but characteristics were similar.

Conclusion SDs and spreading depressions of spontaneous activity display correlates in time-compressed human scalp direct and alternating current EEG that may serve for
their non-invasive detection.

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SYSTEMIC THROMBOLYSIS FOR CEREBRAL VEIN AND DURAL SINUS THROMBOSIS – A SYSTEMATIC REVIEW
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Background and purpose: The use of thrombolytics is frequently mentioned in patients with cerebral venous or dural sinus thrombosis (CVT) who deteriorate despite anticoagulation therapy, but the safety and efficacy of systemic thrombolysis in these cases is unknown.

Method: To find cases of CVT patients treated with systemic thrombolysis, we performed a PubMed search up to December 2011, checked the reference lists of all identified studies and used data from the International Study on Cerebral Vein and Dural Sinus Thrombosis (ISCVT). Data were extracted by means of a standardised data form. We classified outcomes at last follow-up by the modified Rankin Scale (mRS).

Results: Sixteen studies (26 patients, two from the ISCVT and 24 from the systematic review of the literature) were included. No randomised clinical trial (RCT) was found. Urokinase was the thrombolytic most frequently administered (19 [73,1%]). Intracranial haemorrhages occurred in 3 cases (11,5%), extracranial in 5 (19,2%) and overall there were 3 cases with serious bleeding (11,5%). Partial or complete recanalisation was verified in most patients (16 [61 %]). Survival rate was of 92 % (24/26 patients). 22/25 patients (88%) regained independence (mRS, 0-2), 2/25 (8%) died and 1 (4%) was severely dependent (mRS, 3-5).

Conclusions and interpretations: The great majority of CVT patients treated with systemic thrombolysis regained independence and only two deaths occurred. Bleeding rates were similar to those obtained in a previous systematic review concerning the use of thrombolytics in CVT. Systemic thrombolysis appeared to be reasonably safe in the published cases, but its efficacy and safety are uncertain because of lack of controlled studies and the possibility of publication bias.

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Acute unilateral hearing loss – a potential presenting symptom of lateral sinus thrombosis
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Background. With the increasing availability of non-invasive imaging techniques, cerebral sinus venous thrombosis (CSVT) is nowadays increasingly often diagnosed. However, CSVT may also be associated with unspecific or atypical clinical symptoms, which may result in a significant diagnostic delay. Methods. We thus searched our radiological database based on brain CT or MRI with additional venography for all CSVT patients that were admitted to the neurology department between the years 2000 to 2010 to characterise such unexpected cases. Subsequently we systematically analysed clinical data (demographics, symptoms at onset, risk factors), neuroimaging characteristics and obtained follow-up information from medical records.

Results. We identified a total of 38 CSVT patients (79% female) with a mean age of 44.5±17.2 years. Headache (n=29; 76%) represented the most frequent symptom at onset and was clinically isolated in 15 patients (40%). Twelve patients (32%) revealed a focal neurological deficit and six (16%) had initial seizures. Parenchymal lesions as evidenced by neuroimaging were present in only 11 (29%) patients. The overall prognosis was good, with no lethal outcome. Only four (10.5%) patients were dependent on nursing (modified Rankin scale >/=3/6). Three patients (female/38 y, female/33 y, male/48y) showed a stereotyped onset of acute unilateral hearing loss (with concomitant tinnitus and headache in 2 of them), and were thus initially treated with rheological infusions at the ENT department. After discharge, a subsequently recommended ambulatory brain MRI demonstrated ipsilateral thrombosis of the lateral venous sinus. Both females were on oral contraceptives, and one had a heterozygous factor V Leiden mutation.

Conclusion. Our series suggests that CSVT may often present with isolated headache or rather unspecific symptoms. In particular, acute unilateral hearing loss in conjunction with headache or risk factors for CSVT should raise the suspicion of ipsilateral lateral sinus thrombosis. Such scenarios call for rapid brain imaging including venography.

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Leucocyte concentration and future risk of SAH. A prospective cohort study.

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Background

Inflammation has been suggested as a central pathological mechanism in intracranial aneurysm formation and rupture, causing subarachnoid haemorrhage (SAH). However, the presence of systemic low-grade
Inflammation in relation to the future incidence of SAH is only sparsely studied. The purpose of this study was to evaluate the relationship between leucocyte count, a marker of chronic systemic inflammation, and the risk of SAH in a large prospective population-based study.

Methods
Leucocyte count and other cardiovascular risk factors were measured in 19,821 individuals (17,100 men, 2,721 women, mean age 44 years) participating in a screening program between 1975 and 1980. Incidence of SAH in relation to baseline leucocyte concentrations was studied during a mean follow-up of 27 years.

Results
Ninety-five participants had a SAH, corresponding to an incidence of 22 per 100,000 person years in women and 17 per 100,000 in men. The hazard ratio (HR) for SAH in the highest compared to the lowest quartile of leucocytes (i.e. 7.1-19 vs. 2.0-4.6 × 10^9 cells/L) was 2.22 (95% CI 1.19-4.13, p for trend over quartiles = 0.010). The association was only slightly weakened (HR 2.10, 95% CI 1.08-4.07, p for trend over quartiles = 0.029) after adjustments for several potential confounders including smoking and hypertension.

Conclusions
Systemic inflammation measured as leucocyte concentration predicts future incidence of SAH.
ICH volume was associated with increasing dependency (0.15 point increase in mRS for each 1 cm³ increase in ICH volume, p<0.05); and worse quality of life analysed as individual components of the EQ-5D: mobility, usual activities, self-care, anxiety and pain. In contrast, ICH volume was not related to cognition, EQ-5D, EQ-VAS, or mood. Since ICH volume was strongly related to baseline stroke severity (Scandinavian Stroke Scale, SSS), SSS was excluded from further analyses. In multiple variable analyses, with adjustment for age, sex, time to randomisation, systolic blood pressure and baseline ICH volume, volume was a significant predictor for dependency (0.18 point increase in mRS for each 1 cm³ increase in ICH volume). In the absence of univariate associations, multiple variable models for the other day 90 outcomes were not performed.

Conclusion: Baseline ICH volume is independently related to poor outcome at day 90, assessed as increasing dependency (mRS). Perhaps surprisingly, ICH volume was not associated with other functional outcome measures. Preventing haematoma expansion and re-bleeding to minimise ICH volume, e.g. potentially with haemostatic agents or by lowering BP, could reduce dependency.

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Delayed Cerebral Ischemia after Subarachnoid Hemorrhage: a Systematic Review of Clinical, Laboratory and Radiological Predictors
increased risk in women, patients with history of hypertension, history of diabetes, hyponatremia, or early systemic inflammatory response syndrome. There was strong evidence that previous use of aspirin and location of the aneurysm were not associated with risk of DCI. Conclusions: Smoking and hyperglycemia are predictors of DCI. In future, these factors should be included for a prediction model together with amount of blood and clinical condition on admission.

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Cerebral venous sinus thrombosis in the last 5,5 years in a Portuguese hospital
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Background: Cerebral venous thrombosis (CVT) is a rare disease, whose knowledge has improved over the past decade. Purpose: clinical characterization of patients with CVT observed in a tertiary hospital in the past 5,5 yrs. Methods: Retrospective study; demographic and clinical data including diagnostic investigation, risk factors, treatment and complications were collected from medical records of adults with CVT admitted between January 2006-June 2011. Statistical analysis: software SPSS V20.0.0 (p<0.05). Results: 66 patients, 82% women, mean age 39,9 yrs. 58% were diagnosed during the first week (median 5 days). Common clinical presentations: headache (76%); papilledema (29%); altered mental status (27%). 17% had seizures which were associated with cerebral parenchyma lesion. 50% of cases were diagnosed by CT venography. 4,5% were recurrences. Transverse sinus was the most frequent location (76%) and combined thrombosis occurred in 70%. More than one risk factor was identified in 63%; none in 4,5%. Genetic and acquired thrombophilia: 38% and 29%, respectively. 50% of women were on oral contraceptives; only 3,7% had CVT during pregnancy/ puerperium. All patients diagnosed in the acute phase were anticoagulated, mostly with low-molecular-weight heparin. Acute mortality rate: 3%. 52% of the followed patients remained anticoagulated for life. Late complications: chronic headache (19%), depression (7%), epilepsy (5%), dural arteriovenous fistula (5%). There were no recurrences of CVT or death. Conclusion: Comparing to literature data, we highlight the shorter time to diagnosis, the predominance of the transverse sinus thrombosis and different risk factors. Cases without etiology were less frequent, probably due to more extensive study. Because of a persistent prothrombotic condition most patients were on chronic anticoagulation. Mortality and recurrence rates were low. We hypothesize that a better knowledge of CVT is improving clinical management.
Background – Spontaneous (non-traumatic) intracerebral haemorrhage (ICH) location may influence outcome, but the findings of previous studies have varied. We sought to determine whether the location of ‘primary ICH’ (without an identifiable underlying cause) influenced one month case fatality in a community-based study. Methods – We used multiple overlapping methods of case ascertainment and follow-up to prospectively identify all adults with spontaneous ICH (whether admitted to hospital or not) diagnosed between 1 June 2010 and 31 May 2011 in the Lothian Health Board region of Scotland (population aged ≥16 years 695,335). The diagnosis of ICH was made by post mortem examination or brain imaging (in which case a neuroradiologist confirmed diagnosis and categorised ICH location). Results – We identified 169 adults with ICH (incidence 0.24 per 1000 per year, 95% confidence interval [CI] 0.21 to 0.27), of whom 29 were secondary ICH and 140 were primary ICH (incidence 0.20 per 1000 per year, 95% CI 0.17 to 0.23). Primary ICH locations were single lobar (n=64), single lobar extending to non-lobar (n=4), multiple lobar (n=2), single non-lobar (n=67), multiple non-lobar (n=1), or unknown (n=2). There was no difference between adults with any lobar primary ICH (n=70) versus solely non-lobar primary ICH (n=68) in age (median 80 years, interquartile range [IQR] 70 to 84 versus 76 years, IQR 65 to 85; p=0.43), male sex (40% versus 48.5%; p=0.31), or 30 day case fatality (42.9% versus 42.7%; odds ratio adjusted for age and sex 1.17, 95% CI 0.59 to 2.34). A sensitivity analysis restricted to adults with solely lobar ICH produced similar results (40.6% versus 41.8%; odds ratio 1.24, 95% CI 0.61 to 2.52). Conclusions – In an ongoing prospective community-based study, 30 day case fatality was similar after lobar and non-lobar ICH, and we will investigate residual confounding in future analyses.

Introduction: The ICH score (0 to 6 points) is a simple clinical grading scale that allows risk stratification in the time of onset of intracerebral hemorrhage (ICH) with prediction of 30-day mortality. We were interested if the ICH score is useful for prediction of mortality and functional outcome in our
clinical practice.

Methods: Retrospective single centre study on consecutive ICH patients admitted to intensive care unit of university hospital from January 2010 to August 2011. The primary outcome was mRS on day 30 after ICH. Multiple regression was used to identify predictors of poor outcome (mRS 3 to 6).

Results: 48 patients were included in study. Mean age 67.2 (26-90) years, 15 (31%) were above 80 years. No patient scored (sc.) 6 points, a single ICH 5 (2%), 2 sc. 4 (4.1%), 4 sc. CH 3 (8.3%), 8 sc. 2 (16.6%), 18 sc. 1 (37.5%) and 15 sc. 0 (31.2%). No patient with score 0 died and the patient with score 5 died (100%). One patient with ICH 1 died (5.5%), 2 died with ICH 3 (37.5%), 3 died with ICH 2 (50%), none with ICH 4 died. One third of patients above 80 died (5/15). All patients with infratentorial localisation of hemorrhage survived (all had volume of hemorrhage > 30 cm3). All patients who scored 2 points in ICH for low GCS died, in group with haemoecephalus died 2 out of 10 (20%). Poor outcome (3 and more in mRS) was in all patients with ICH score over 3. Only ICH 0 had good outcome (mRS 0-2) in 60% patients. In both ICH 1 and 2 was poor outcome in 70% and good outcome only in 27% and 25% resp. Multiple regression identified only two factors in our cohort as significant for poor outcome (mRS 3-6): hemorrhage volume above 30 ml (OR=7,000, 95% CI 1.364 to 35.929, p=0.011) and age above 80 years (OR=4.789, 95% CI 1,048 to 24,715, p=0.048).

Conclusion: Our results support validity of ICH score for bedside prediction of mortality and functional outcome. Incorporating ICH score into daily clinical practice could be helpful in stating the prognosis in individual cases.

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Clinical non-hemorrhagic complications of radiosurgically treated brain arteriovenous malformations.

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Background and Purpose: radiosurgically treated brain arteriovenous malformations (AVM) can develop complications other than bleeding, but data on frequency and radiological correlation are lacking.

Methods: We studied the clinical evolution of 108 patients during a median of 54 months. New or worsening seizures, focal deficits and symptoms of endocranial hypertension (EHT) were noted during annual follow ups.

Results: seven patients (6.5%) presented either new seizures (2 cases) or noticeably increased frequency despite best medical treatment (5 of the 44 patients with known seizures). Non-hemorrhagic focal deficits were noted in 3 cases (2.8%), and EHT in 4 cases (3.7%). While progression of seizures was not correlated with radiological findings, all patients with focal deficits and
EHT save one had extensive postradiation edema or necrosis on their brain MRI studies. Conclusions: hemorrhage is not the only complication of radiosurgically treated AVM. Albeit small, there is a risk of new seizures, focal deficits and EHT.

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Nontraumatic convexity subarachnoid hemorrhages: similar images but different aetiologies
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Introduction: Nontraumatic subarachnoid hemorrhage (SAH) exclusively located in the brain convexity sulci (cSAH) is a rare subtype of SAH, with multiple aetiologies and clinical features different from aneurysmal SAH.

Methodology: We conducted a review of prospectively collected clinical cases of cSAH, admitted to the stroke unit of a terciary hospital, from January 2006 to November 2011. cSAH was defined as hypodensity exclusively in cortical sulci on brain CT. Recorded variables were: demographics, clinical presentation, aetiology, clinical and imagiological investigation and outcome (Modified Rankin scale at discharge).

Results: Of 210 SAH admitted during the study period there were 16 cases of cSAH (corresponding to 7.6% of all non traumatic SAH), 9 males, mean age 63 years (35-84, 62.5% >60 years). The most common clinical manifestation was focal deficits in 9 cases (62.5%), followed by severe headache in 4 (25%) and seizures in 3 (18.75%). Predominant location of cSAH was in frontal sulci. Brain MRI with T2* and FLAIR sequences was performed in 14 cases. Five cases (31.25%) showed an association with significant carotid atherosclerotic stenosis (greater than 70% or occlusion) ipsilateral to cSAH. Possible cerebral amyloid angiopathy was diagnosed in only one case. Other causes were cerebral venous thrombosis, reversible vasoconstriction syndrome (RVCS), dural fistula. It was not possible to identify the aetiology in two cases (12.5%). 18.8% of patients were dependent (mRankin score >2) at discharge.

Conclusions: In our series amyloid angiopathy, common cause of cSAH in the elderly in previous reports, was underrepresented. On the other hand, unlike previous reports, we found a significant association between atheromatous stenosis and the occurrence of ipsilateral cSAH. cSAH has a pleomorphic clinical presentation and should lead to a careful clinical and imaging evaluation, including cervical vessels.

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Superficial siderosis is a warning sign for future intracerebral hemorrhage in patients with cerebral amyloid angiopathy
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Background:
Supratentorial superficial siderosis (SupSid) is a common finding in patients with cerebral amyloid angiopathy (CAA) and is most probably caused by focal subarachnoid hemorrhages (fSAHs). Single case studies proposed that such fSAHs might be a risk factor for future lobar intracerebral hemorrhages (ICHs). Here we tested the hypothesis if a SupSid as a residue of fSAHs must be regarded as a warning sign for future ICH in CAA patients.

Methods:
Imaging and clinical data sets of 51 patients with SupSid due to suspected CAA were retrospectively analyzed. Subjects were identified by a systematic database search at our institution (years 2000 to 2010). On follow-up imaging, a new ICH was classified as a “warning sign-ICH” (WS-ICH) if it occurred in close vicinity to the preexisting SupSid, i.e., involved at least one gyrus affected by SupSid on baseline imaging. ICHs distant from the SupSid were classified as non-warning-sign ICH (NWS-ICH).

Results:
The median follow-up time period was 35.3 months (range: 6 to 120 months). 24 of 51 patients (47.1%) presented with any new intracranial hemorrhage during follow-up. A WS-ICH was observed in 13 patients (25.5%), while only NWS-ICHs were found in 5 cases (9.8%). New SAHs without any ICH were observed in 6 patients (11.8%).

Conclusion:
We conclude that patients with SupSid are at high risk for subsequent ICH or SAH. SupSid can be considered as a warning sign of future ICH at its location. Prospective studies are needed to confirm and further evaluate these findings.

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Clinical features and outcome of cerebral vein and sinus thrombosis: an analysis of 60 cases
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Background: The clinical features and prognosis of cerebral vein and sinus thrombosis (CVST) were described. Methods: All the medical records, including sex, age, clinical manifestations, features of imaging, treatment and prognosis were analyzed retrospectively in sixty cases of CVST from Jan. 2003 to Dec. 2009 in Huashan Hospital. Results: Of the 60 cases (35 men, 25 women), aged from 8 to 73 (mean 35.5±14.6) years old. Most patients were acute or subacute onset, 48 cases (80%) had headache, 23 cases (38.3%) had epilepsy, 22 cases (36.7%) had visual symptoms, 16 cases (26.7%) had focal deficits, 9 cases (15%) had unconscious disturbance. 37 cases (61.7%) showed parenchymal abnormal changing in CT/MRI imaging, which was edema or infarction, and 11 cases (18.3%) accompanied with hemorrhage. Veins and sinus stenosis or occlusion showed by angiography. 56 cases (93.3%) treated by antithrombosis methods, among them 91.1% used anticoagulation. After the treatment, 51 cases (85%) recovered completely, 7 cases improved, and 2 cases died of brain herniation. Conclusion: Most patients had headache and epilepsy, edema accompanied with hemorrhage was the characters of imaging. Most patients recovered after anticoagulation treatment. Key words cerebral vein and sinus thrombosis; clinical features; outcome

Figure 1. male, 15-year old, had headache, vomit and seizure, A shows left temporal hematoma, B shows lobulated edema, C shows superior sagittal sinus disappeared, cortical vein dilated

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Long-term outcome and quality of life after poor-grade aneurysmal subarachnoid hemorrhage
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Background: Among patients with aneurysmal subarachnoid hemorrhage (aSAH) poor clinical grade (WFNS grades 4 and 5) is associated with poor clinical outcome. However, several recently published clinical series suggest that a substantial proportion of these patients regains functional independence and an acceptable quality of life. Methods: In this single-centre retrospective study we analyzed long-term functional...
OF THE SUBARACHNOID HAEMORRHAGE: RESULTS OF AN EARLY TREATMENT.

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Background. Subarachnoid haemorrhage (SAH) is an important cause of mortality and morbidity. There is considerable uncertainty regarding what the best treatment is, either surgical or endovascular, and the external validity of the ISAT trial. For these reasons, studies to confirm the effectiveness of endovascular treatment in clinical practice are necessary.

Methods. A descriptive study of patients with SAH who underwent angiography, performed during a period of two years, in a tertiary hospital in which endovascular approach is the first-line treatment. Results. A total of 107 patients were identified. Mean age was 54.7 years, 78 patients were female. All patients received aneurysm repair within 72 hours of symptom onset: coiling in 72 patients (67%) and clipping in 35 patients (33%). Twenty-five patients (23%) died during the acute hospital phase. The remaining 82 patients were referred for rehabilitation. After a mean follow-up interval of 3.3 years a total of 35 patients (33%) had died and two patients were lost for follow-up. MRS scores could be obtained in 62 of 70 survivors, 40 of them (65%) were functionally independent (mRS & 8804; 2). Quality of life was perceived moderately reduced compared to a healthy age- and sex-matched German population and slightly reduced compared to a general SAH population. However, it was perceived substantially better than that of unselected stroke patients.

Conclusion: Poor-grade aSAH is not necessarily associated with poor outcome. After early aneurysm repair, about two thirds of patients survive. Among survivors about two thirds regain long-term functional independency. Quality of life in these patients seems to be relatively good.
Resolution In Intracerebral Hemorrhage (SHRINC) trial is a prospective, placebo-controlled, dose-escalation safety trial in which patients with spontaneous ICH are randomly allocated to standard care or treatment with escalating doses of pioglitazone. Functional outcome is evaluated at baseline, 3 months and 6 months with the NIHSS score, Modified Rankin Scale (mRS), and Barthel Index (BI). Longitudinal analysis of functional outcome was evaluated by Generalized Estimating Equation and generalized linear mixed model.

Results
Forty-one consecutive patients were included in this interim analysis. Baseline demographics: mean age 54 years; 76% had hypertension and 29% had diabetes; median GCS 14 (IQR 9,15). For mRS, changes between the 3 and 6 month time points remained significantly different (p=0.02); however, during the same period, no significant differences were observed for NIHSS (p=0.28) and BI (p=0.25).

Conclusions
Our data suggest that patients with ICH continue to have functional recovery, measured by mRS, during the 6 month follow up. The NIHSS and BI appeared to plateau between the 3 and 6 month time points. Limitations include our relatively mildly affected ICH population and we did not follow patients beyond 6 months. We cannot exclude a treatment effect on outcome since the study remains on-going; however, our results suggest that further study is necessary to determine the ideal measures and timing of functional outcome in patients with ICH.
Matrix metalloproteinases (MMPs) in charge of perihematoma edema (PHE) development following spontaneous intracerebral hemorrhage (SICH)?
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Methods: Forty nine consecutive SICH patients were included in the study. Serum was collected within 24, 48, 72 hours and on day 7 after SICH onset. MMP-2, MMP-9, TIMP-1 and TIMP-2 concentration was measured by means of enzyme-linked immunosorbent assay (ELISA). MMPs and TIMPs blood concentration were related to the results obtained from manual planimetric volumetry analysis of the brain CT scans performed on admission, after 24 hours and between day 3 and 7 from admission.

Results: Significant relationships were found between radiological SICH features and their progression and MMPs but also TIMPs change over one week after SICH onset.

Conclusions: Gelatinases may contribute to expansion of hematoma and PHE. This effect is accompanied by TIMPs suggesting these biomarkers as potential therapeutic target.

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Mastoid air sinus abnormalities associated with lateral sinus thrombosis
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Background: An association between Cerebral Venous Thrombosis (CVT) of the lateral sinus and ipsilateral mastoid air sinus abnormalities has rarely been suggested in the literature. Though some authors have attributed these changes to inflammation/
infection, venous congestion due to sinus thrombosis is an alternative hypothesis. We aimed to evaluate the frequency of mastoid air sinus MRI abnormalities in patients with CVT to support the relevance of this sign in CVT diagnosis.

Methods: Analysis of CVT patients admitted to Santa Maria Hospital Stroke Unit between 2008 and 2011. Patients with available MRI were included. Brain MRIs (T2, FLAIR and DP) were independently observed by two examiners and the presence of mastoid reticular hypersignal was registered. Association between mastoid abnormalities and CVT location was analysed.

Results: 17 patients with CVT were included (15 women, mean age of 36.5 years). The sites of sinus thrombosis were: lateral sinus in 16 patients (unilateral in 11, bilateral in 5, isolated in 4), superior sagittal sinus in 7 and straight sinus or deep veins in 10 patients. Mastoid MRI abnormalities were detected in 5 patients. MRI abnormalities occurred only in the presence of ipsilateral transverse and sigmoid sinus thrombosis. None of the 5 cases had clinical evidence of ear infection that could be the cause of the abnormalities. None of those 5 cases had encephalic lesions.

Conclusion: Mastoid MRI abnormalities were a common sign of lateral sinus thrombosis. In our cases, they were not related to ear infection, supporting the hypothesis of venous stasis, since venous mastoid drains mainly to the sigmoid sinus. This indirect sign of lateral sinus thrombosis might be used to improve the diagnosis in doubtful cases of this sinus thrombosis.

The role of patient examination with loss of conscious in emergency care

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Background: The loss of conscious is a steady cause of calling ambulance and hospital admittance in Europe and in US. The aetiology of acute episode of unconsciousness might be various but in many cases syncope with acute cerebral ischaemia is present. Our aim was to assess the implementation of the syncope guideline in emergency care, to show up failures in the care delivery process and give recommendations for the practice.

Methods: A retrospective patient’s record review was conducted in a Hungarian city (Keszthely). Both prehospital and hospital data were collected including all patients presenting an episode of syncope to ambulance care between January 1, 2007 and December 31, 2008 (N=226). Cases like epilepsy or traumatic brain injury were excluded.
Background: This study tests for the presence of differential item functioning (DIF) in the EQ-5D quality of life instrument, using data from the ENOS trial in acute stroke. DIF occurs when subjects in a subset of a sample respond differently to items within a measurement instrument, despite possessing the same latent traits.

Method: The trial data comprised 1,462 records and DIF was analysed with respect to reporting by patient vs proxy, and by geographical region. The patient’s clinical outcome measurements were regressed (scores from the modified Rankin Scale, Barthel Index and Zung Depression scale) on their EQ-5D index scores, whilst including dummy variables for both proxy responses and region of treatment (UK, Asia, rest of world). We predicted the EQ-5D levels recorded on each of the five component dimensions, using the clinical measures and the dummy variables.

Results: The mean EQ-5D index was 0.53 (SD 0.37) and EQ visual analogue scale 65.6 (SD 22.3). Overall, 103 different health state vectors were represented, including both extreme states. Proxies were more likely to report health problems than patients, although the differences did not result in any significant divergence in index scores between patient and proxy reports. The distributions of reported levels of problems for similar clinical states differed significantly by region; mean index score
for UK responses was higher than mean scores from Asia and the rest of the world. Non-UK respondents were more likely than UK patients to report some or severe problems on pain and depression dimensions. Respondents in Asia were more likely to report mobility problems but less likely to report problems with usual activities.

Conclusion: DIF with respect to patient vs proxy responses to the EQ-5D is detectable after stroke, although the impact on the mean index scores is insignificant and unlikely to be a source of concern. DIF with respect to multinational responses is detectable but, in this case, the impact on index scores is significant. It would be unwise to make recommendations until further multinational EQ-5D studies of stroke, other medical conditions and circumstances, have reported.

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**Economic evaluation of dabigatran etexilate in stroke prevention in patients with non valvular atrial fibrillation**

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Background:

Currently, the main clinical guidelines recommend the administration of anticoagulants as primary prevention in patients with AF at risk for stroke. The proven efficacy and safety results of dabigatran etexilate support its recommendation as first-line treatment compared with vitamin K antagonists (VKA).

We assessed the cost-effectiveness of dabigatran for the prevention of stroke and systemic embolism in patients with non valvular atrial fibrillation (AF) in Spain, under the National Health System perspective.

Methods: A sequential Markov model simulating the natural history of the disease in a 10,000 patients cohort with non-valvular AF compared dabigatran to warfarin in a first scenario, and to a real-world prescription pattern in a second scenario (60% of patients treated with VKA, 30% with acetylsalicylic acid and 10% non treated).

Probabilities of events obtained from RE-LY study for dabigatran and warfarin, and from a meta-analysis for acetylsalicylic acid and no treatment.

Results: Dabigatran reduced the occurrence of clinical events in both scenarios, providing gains in terms of quantity and quality of life.
The incremental cost-effectiveness ratio for dabigatran compared to warfarin was €17,581/QALY gained and €14,118/QALY gained compared to the real-world prescription pattern in Spain. Probabilistic sensitivity analysis confirmed the robustness of the model and results.

Conclusions: Incremental Cost-Effectiveness Ratios obtained were below the €30,000/QALY threshold, considered as the acceptable efficiency level for Spain. Dabigatran is an efficient strategy for the prevention of stroke in patients with non-valvular AF compared to warfarin and to the real-world prescription pattern, under the Spanish National Health System perspective.

Keywords: cost-effectiveness, dabigatran, stroke prevention, atrial fibrillation

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Effect of a stroke recognition tool on inter-hospital stroke thrombolysis transfers
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Background
Our institution provides a regional stroke thrombolysis service covering 5 acute hospitals. We examined the effect of implementation of the ROSIER stroke recognition instrument on regional activity.

Methods
We conducted prospective analyses of thrombolysis referrals from other hospitals before and after introduction of a referral proforma that included the ROSIER scale. The diagnosis at time of referral was considered “probable stroke” if ROSIER score was >0.

Results
33 patients were referred during period 1 (14/10/10-25/11/10): 20 (61%) were accepted and 8 (24%) received thrombolysis. 27 patients were referred during period 2 (03/10/11-21/11/11): 21 (78%) were accepted (20 “probable stroke” by ROSIER and 10 (37%) received thrombolysis (all “probable stroke” by ROSIER)). There was no significant difference in proportion of transferred patients receiving treatment (p=0.76).

Reasons for not accepting referrals included comorbidity-related contraindications (period 1, 7 (21%); period 2, 5 (19%)) and elapsed time from onset (period 1, 6 (18%); period 2, 1 (4%)).

Median (IQR) length of stay in our unit was 3 (0.25-4.75) days during period 1 and 2 (0-6.5) days during period 2 (p=0.84). Most had cardiac investigation additional to brain imaging before repatriation to the referring hospital (period 1, 12 (60%); period 2, 14 (67%)).

Conclusion
ROSIER use was not associated with a significant increase in proportion of transferred patients receiving thrombolysis or reduced length of stay. Fewer than half of transferred patients were treated. Our experience suggests implementation of the ROSIER scale in isolation does not improve efficiency of a regional thrombolysis service.
Background: National and international guidelines recommend cognition and mood assessment for all stroke survivors but there is no formal guidance on preferred method. We aimed to describe clinical practice in Scottish stroke units.

Method: We created a survey to describe the use of cognitive and mood assessments in acute, rehabilitation and outpatient stroke settings. The questionnaire was piloted locally and revised. We used mixed methodologies of distribution (online and paper) to ensure comprehensive coverage. We contacted all stroke Managed Clinical Network co-ordinators (n=12) across Scotland to distribute the link; we emailed specialist groups and we distributed paper copies through the U.K stroke forum delegate pack (n=1400).

Results: There were a total of 100 responses. Respondents comprised Nurses (18), Speech therapists (9), Physiotherapists (9), Occupational therapists (18), Clinicians (27), Psychologists (4) and other health professionals (15). Return rate was 6.6%. Of respondents 80(80%) routinely assess cognition and 61(61%) mood. A variety of tools are used (cognitive n=31; n=17 mood), Mini Mental State Examination (MMSE) 93(28% of total testing) and the Hospital Anxiety and Depression Scale (HADS) 58(35%) are the most common. Informal and bespoke methods were also prevalent “observation” 5(13%) and “informal questioning” 11(21%). Occupational therapists and Psychologists, have the highest rate of assessing cognition (100%) and mood (94,100% respectively). Cognition is mostly assessed during first/acute admission 155(43%) while mood is most commonly assessed in the rehabilitation setting 86(49%).

Conclusion: Response rate was low but included all Scottish regions with active stroke services. Although the majority of responders are assessing cognition and mood there is substantial heterogeneity in measures used. We suggest research to describe effective assessment measures and development of protocols with standardised assessment strategies.
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(ABCD2 score of > 4) < 24 hours from referral in a fixed outpatient clinic set up. The clinic had 6 fixed TIA slots across 3 sites per week day with 4 per day at weekends.

Methods:
A corresponding 12 month activity period before and after expansion of the rapid access TIA clinic were recorded via prospective database and retrospective data analysis. The first 100 patients per site were selected consecutively from those who attended clinic starting from the due dates.

Results:
In the first audit cycle (Oct 2006 – Oct 2007) the initial 160 trust wide referrals were analysed and 50 (31%) were diagnosed with a TIA, 60 (38%) had a diagnosis of stroke and the rest 40(41%) had a non neurovascular diagnosis. 14% of all TIA patients were seen within one week.

In the 2nd audit cycle (Oct 2010 – Oct 2011), the initial 269 referrals were analysed and 88 (33%) had a diagnosis of TIA, 31 (12%) had a diagnosis of stroke and the rest 119 (45%) had a non neurovascular diagnosis. 48% of all patients with an ABCD2 > 4 were seen within 24 hours.

Conclusion:
The fixed 7 day TIA service is a vast improvement upon a 5 day service although was unable to accommodate all high risk TIA patients (ABCD2 > 4) < 24 hours of the referral. Adopting telephone triaging and a flexible TIA service avoiding any queuing are possible options to improve the service.

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Table 1: Prevalent cognitive/mood assessment modalities use in clinical settings.

<table>
<thead>
<tr>
<th>Test</th>
<th>Total (n) and % of tests used in clinical settings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Absolute total</td>
</tr>
<tr>
<td>Cognitive Assessments</td>
<td></td>
</tr>
<tr>
<td>Mini Mental State Examination (MMSE)</td>
<td>83 (28%)</td>
</tr>
<tr>
<td>abbreviated Cognitive Examination-Revised</td>
<td>65 (19%)</td>
</tr>
<tr>
<td>Abbreviated Mental Test (AMT)</td>
<td>64 (19%)</td>
</tr>
<tr>
<td>Mood Assessments</td>
<td></td>
</tr>
<tr>
<td>Hospital Anxiety and Depression Scale (HADS)</td>
<td>58 (35%)</td>
</tr>
<tr>
<td>Geriatric Depression Scale (GDS)</td>
<td>36 (22%)</td>
</tr>
<tr>
<td>Depression Intensity Scale (DISCS)</td>
<td>13 (8%)</td>
</tr>
</tbody>
</table>

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Fixed capacity TIA services may not be able to see all high risk patients <24hrs
East Kent Hospitals NHS trust, Ashford, UNITED KINGDOM

Background
Preventing strokes by identifying high risk TIA patients and initiating appropriate risk factor management and prophylactic treatment measures is one of the main principles of the National Stroke strategy in the UK. The East Kent University Hospitals NHS Foundation trust which provides medical services for 730,000 was running a rapid access TIA clinic open 5 days a week in October 2007. This extended to cover all 7 days of the week with same day access to MRI/CEMRA April 2009 with the objective of seeing all the high risk TIA patients (ABCD2 score of > 4) < 24 hours from referral in a fixed outpatient clinic set up. The clinic had 6 fixed TIA slots across 3 sites per week day with 4 per day at weekends.

Results:
In the first audit cycle (Oct 2006 – Oct 2007) the initial 160 trust wide referrals were analysed and 50 (31%) were diagnosed with a TIA, 60 (38%) had a diagnosis of stroke and the rest 40(41%) had a non neurovascular diagnosis. 14% of all TIA patients were seen with in one week.

In the 2nd audit cycle (Oct 2010 – Oct 2011), the initial 269 referrals were analysed and 88 (33%) had a diagnosis of TIA, 31 (12%) had a diagnosis of stroke and the rest 119 (45%) had a non neurovascular diagnosis. 48% of all patients with an ABCD2 > 4 were seen within 24 hours.

Conclusion:
The fixed 7 day TIA service is a vast improvement upon a 5 day service although was unable to accommodate all high risk TIA patients (ABCD2> 4) < 24 hours of the referral. Adopting telephone triaging and a flexible TIA service avoiding any queuing are possible options to improve the service.

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time on a Stroke bed [target-95%]. New
initiatives such as the implementation of
Joint Care Plans and pathways for patients
requiring Carotid intervention have been
established.

CONCLUSION: The role of the Stroke co-
ordinator has facilitated dialogue between
clinicians across organizational boundaries
to inform and implement stroke policy and
protocol. It has been integral in the collec-
tion of data regarding operational activity
which has supported the delivery, develop-
ment and implementation of services. This
role continues to expand its remit and has
firmly entrenched its position as a vital fo-
cus in delivery of an organized stroke ser-
vice.

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THE USE OF STANDARDIZED OUT-
COME MEASURES IN REHABILITA-
TION CENTERS IN KOREA
I.L. Shin, K.L. JOA, S.K. KIM, J.H. MIN,
C.H. Lee, Y.B. Shin, H.Y. Ko
Pusan National University Yangsan Hospi-
tal, Yangsan, SOUTH KOREA

Background: The objectives of present
study were to identify the rehabilitation
outcome measures currently used in Korea.
Methods: The survey was conducted by
e-mail questionnaire to 165 rehabilitation
centers in Korea (75 training hospitals, 20
rehabilitation hospitals, 70 care hospitals).
Non-responders were sent a second copy of
the questionnaire if the fail to answer with-
in 1 week. Data from the returned question-
naires were entered into a Microsoft Excel
Management and economics

Stroke research and implementation across Europe: is there a role for patients and the public?

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KING’S COLLEGE LONDON, LONDON, UNITED KINGDOM\textsuperscript{1}, KING’S COLLEGE LONDON, LONDON, UNITED KINGDOM\textsuperscript{2}, , LONDON, UNITED KINGDOM\textsuperscript{3}, Stiftung Deutsche Schlaganfall-Hilfe, GÜTERSLOH, GERMANY\textsuperscript{4}, Stiftung Deutsche Schlaganfall-Hilfe, GÜTERSLOH, GERMANY\textsuperscript{5}, KING’S COLLEGE LONDON LONDON,UNITED KINGDOM\textsuperscript{6}

BACKGROUND: Across Europe, health care systems and providers are encouraged to promote greater participation of citizens in their own health, clinical research and health service quality improvement. It is argued that such citizen participation leads to improved outcomes for individual and health systems. Little is known about the actual or potential role of stroke patients to participate in these processes.

METHODS: As part of an EU Framework 7 Programme (EIS), we conducted a survey of people recruited to stroke registers in England, Scotland, France, Italy and Germany. A questionnaire was developed, translated into local language versions and administered to consecutive samples of stroke register participants at one year after incident stroke. The questionnaire aimed to assess stroke survivors’ views of their role in research implementation and to identify

Results: A total of 51 (30\%) responses were received. Of these, 80\% units collected some outcome assessment measure as part of routine clinical practice. K-MBI(Korean Modified Barthel Index) (74\%) and FIM(Functional Assessment Measure) (59\%) were the most popular global outcome measures. The K-BBS(Korean Berg Balance Scale) (53\%) were used most frequently for balance measure. Upper extremity function was checked with Jebsen hand function test (65\%) and hand grip strength (63\%). K-MMSE(Korean Mini Mental Status Exam) or MMSE-K were most popular cognitive function test (78\%). K-WAB(Korean Western Aphasia Battery) were the most popular language test (67\%). Depression and pain were measured by Beck Depression Inventory most frequently (35\%) and by VAS(Visual Analogue Scale) (86\%) most frequently. Thirty-four (67\%) units used outcome results for discussion and goal setting. 78\% units responded that they would use a standardized outcome measures if there is an agreed standardized outcome measures and standardized outcome measure method (84\%), standardized outcome measure lists (65\%), and support of money and time (43\%) were noted as an essential prerequisites for regular standardized outcome measure use.

Conclusion: The survey demonstrated that quite widespread use of outcome assessments in routine clinical rehabilitation within Korea. There is also an agreement for need for standardized outcome measure for rehabilitation.
barriers and facilitators to stroke survivors’ engagement in and participation in stroke research.

RESULTS: We will present data from the survey of 300 stroke survivors, reporting their attitudes to participation in clinical research and perceptions of their own role in quality improvement, including implementation of evidence based practice. Analyses will investigate differences across countries that may reflect national differences in policy and practice, as well as any effects of clinical and socio-demographic characteristics on perceptions and attitudes reported.

CONCLUSIONS: This is the first European-wide study to investigate stroke survivors’ perceptions of their own role in research and quality improvement. Findings will help gauge the success of supra-national and national policies promoting citizen participation, and will have implications for the development and implementation of novel strategies in this area.

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Evidence based change in stroke care: implications for management theory
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Background
The reconfiguration of stroke services in London 2009-2012 has radically altered the strategic delivery of stroke care for a population of 8 million people. 8 HASUs and 21 SUs with specialised staff now provide acute care for Londoners who suffer a stroke. What has been the impact on the management and organisation of clinical staff as a result of these reforms?

Methods
As part of my PhD project, a case study involving 28 semi-structured interviews was performed (Sept – Dec 2010) with clinical and managerial staff working at a combined London HASU & SU. These interviews focused on staff attitudes towards evidence based interventions in stroke care and organisational methods employed to promote these. This data is analysed alongside documentary analysis of NHS London policy documents and data from observations of meetings (Pope & Mays, 1995).

Results
The role played by clinical and managerial leaders in directing and implementing evidence based change is highlighted. The implications of increased data collection methods and ongoing education strategies for staff are discussed. The role of strategic and network governance is emphasised. Finally, implications for practitioner identity are also deemed significant.

Conclusion
The ‘London model’ of stroke care delivery challenges traditional management theories of organisation in healthcare such as Professional Dominance (Freidson, 1970) and New Public Management (Ferlie et al, 1996) in a number of significant ways. It is argued that Foucault’s (2007) governmentality approach may be a fruitful approach to interpreting evidence based change in stroke care management.
Patients were classified by stroke severity according to National Institutes of Health Stroke Scale score (NIHSS), by modified Rankin Scale on presentation and on discharge, and by type of stroke (ischemic or hemorrhagic stroke). Moreover patients with ischemic stroke were classified to subtypes according to TOAST classification. Costs were estimated using the official financial charts listing in euros (€). SPSS statistical package was used to analyse the data.

Results. There were 195 (60.6%) men and 127 (39.4%) women. Mean age was 72.93 (±11.349) years. Median length of stay was 10.69 days. Acute care costs ranged from 220 euros to 20954 euros with a median hospital cost of 3209.08€ per discharge. The cost of ischemic strokes was 3255.96 (±2552.44). It was not statistically significantly different from the cost of hemorrhagic strokes (2971.11±2104.78). Lacunar strokes were the least expensive of all ischemic stroke subtypes with a mean cost of 2130 euros. Severe strokes (with NIHSS on admission over 20), were the most expensive (mean 4739+/−3853). Linear regression analysis demonstrated that stroke severity on admission and stroke subtype were the major independent predictors of total cost.

Background: Economic data for acute stroke management are limited in Greece. The aim of this study is to identify predictors of acute hospital costs in patients of an acute stroke unit in Greece.

Methods. Demographic and clinical data (based on the Athens Stroke Outcome Project) were prospectively collected on 323 consecutive patients admitted to our acute stroke unit (ASU) for a period of 3 years. All health expenditure during the acute hospitalization phase has been recorded.
Impact of an electronic dossier on the quality indicators of patient management

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Emergency Neurology Network (RUN-FC), Besancon University Hospital, Besancon, FRANCE¹, Emergency Neurology Network (RUN-FC), Besancon University Hospital, Besancon, FRANCE², Neurology Department, Besancon University Hospital, Besancon, FRANCE³, Neurology Department, Besancon University Hospital, Besancon, FRANCE⁴, Neurology Department, Besancon University Hospital, Besancon, FRANCE⁵, Neurology Department, Besancon University Hospital, Besancon, FRANCE⁶

Background
In order to standardise stroke management in hospitals across the Franche-Comté region of France, the 27 “Clinical Practice Indicators” established by the HAS (French National Authority for Health), covering warning signs to acute management, have been calculated for 2010.

Methods
The indicators were calculated using the sample of patients discharged from hospital between 1st March 2010 and 30th April 2010 having been diagnosed with stroke. Data from 500 patients were analysed using emergency department reports and discharge letters provided retrospectively by the 10 hospitals in the region. In parallel, we developed an electronic Neurology dossier with the aim of closing the loopholes that emerged from our retrospective work.

Results
We were only able to obtain information on 65% of the individual indicators: the distribution is homogeneous across all hospitals. Less than 10% of the information was obtained for 7 of the 27 indicators. The study highlighted the heterogeneity of hospital treatment and enabled us to situate them item by item according to the regional averages. The use of the electronic dossier would enable 89% (24/27) of the CPIs to be attained in an exhaustive, prospective manner with a standardised, simplified analysis of the entire year.

Conclusion
These treatment differences call for a detailed, prospective follow-up of our clinical practices across the whole region. The regional deployment of this comprehensive, standardised dossier improves the quality of care in our hospitals.

Medium-term prognosis after percutaneous PFO closure in patients with TIA/Stroke and paradoxical embolism

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Neurology Department, Centro Hospitalar Lisboa Ocidental (CHLO) - Egas Moniz Hospital; CEDOC, Medical Sciences Faculty, Lisbon New University, Lisbon, PORTUGAL¹, Neurology Department, Centro Hospitalar Lisboa Ocidental (CHLO) - Egas Moniz Hospital, Lisbon, PORTUGAL², Laboratory of Echocar-
Background: Studies with extended follow-up after PFO closure in cryptogenic stroke are scarce. Objective: To assess the medium-term prognosis of TIA/Stroke patients submitted to catheter PFO closure (CC-PFO).

Methods: Follow-up of consecutive TIA/Stroke patients with PFO and presumed paradoxical embolism submitted to CC-PFO consecutively admitted to our institution 2001-2011, retrospectively selected. All pts completed complete stroke study and a pre and post-interventional protocol with contrast-enhanced TEE at 0-1-12 months.

Results: Fifty pts underwent CC-PFO, mean age 48.1±11.7 years; 39 had ischemic stroke, 11 TIA. Fourteen(28%)pts had rest right-to-left shunt (RLS) on TEE; 38(76%) atrial septal aneurysm. The procedure was successful in all pts; 2 had atrial dysrhythmias <3 weeks; 2 significant residual shunts requiring percutaneous repair <2 months. There were no device-related complications.

After qualifying event, 30(60%) pts recovered completely (Rankin 0/1), 5(10%) dependent.

After a mean follow-up of 47.5±32.9 (5-118) months, 34/49(69,4%) pts had recovered completely, 1(2%) was dependent. There were no deaths/peripheral embolic events. Three (6%) pts had recurrent cerebrovascular events: 2 TIA with residual RLS <2 months; 1 ischemic stroke with ICA thrombotic occlusion at 13 months without residual RLS/device complications. Permanent residual RLS (>1 year) was seen in 10 pts. TEE documented 5/38 shunts; 2 small cardiac RLS + 3 noncardiac RLS, presumably pulmonary RLS. TCD documented residual RLS in 8/16 pts.

Conclusions: Medium-term prognosis of Stroke/TIA patients with CC-PFO was favorable, with absent mortality, low dependency rate and low recurrence risk. However, these patients seem to have a sustained risk of further ischemic events, even in the absence of residual shunt, probably of multifactorial etiology. The presence of residual noncardiac RLS after PFO closure is intriguing, suggesting the hypothesis of intrapulmonary shunting (pulmonary AVMs).
Background: Right-to-left shunt (RLS) is one of the important risk factors for stroke, especially in younger patients. The majority of RLS are intracardiac, represented mainly by patent foramen ovale (PFO). Extracardiac RLS (mainly pulmonary arteriovenous shunts) are less common and reported especially in connection with telangiectasia haemorrhagica or liver failure. The aim of this study was to determine the proportion of intracardiac and extracardiac RLS in stroke patients and non-stroke subjects represented by professional and recreational divers using transcranial doppler sonography (TCD).

Methods: 1005 subjects (498 stroke patients and 507 professional and recreational divers) were included in the study. RLS was assessed using microembolic signals (MESs) detection by contrast TCD. Localization of RLS was set according to the time of the first MES (less than 12 s – intracardiac RLS, more than 15 s – extracardiac RLS, 12-15 s – uncertain localization).

Results: RLS was found in 514 subjects (51,14% of investigated subjects); 439 (85,41%) RLS were intracardiac, 54 (10,51%) extracardiac and 21 (4,08%) of uncertain localization. In the stroke group, intracardiac location was found in 79,40%, extracardiac in 14,01%; in the divers group, 92,31% RLS were intracardiac and 6,35% extracardiac.

Conclusion: We have confirmed that RLS occurs predominantly in the intracardiac location. Our data indicate that extracardiac RLSs are relatively common even in patients without other disorder (such as telangiectasia haemorrhagica or liver failure). Higher prevalence of extracardiac RLS in stroke than non-stroke subjects can be caused by higher age of subjects in the stroke group; however, it may also indicate that extracardiac location represents higher risk for brain embolism.

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**New aspects of autonomic dysfunction in acute stroke**

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Dept. of Neurology, University Heidelberg, Heidelberg, GERMANY¹, Dept. of Neurology, University Heidelberg, Heidelberg, GERMANY², Dept. of Neurology, Comenius University Bratislava, Bratislava, SLOVAKIA³, Dept. of Neurology, University Heidelberg, Heidelberg, GERMANY⁴

Background. Acute stroke has been associated with several manifestations of autonomic dysfunction including cardio-
Hypotensive strokes frequently occur in the context of severe carotid disease. Otherwise, minimal evidence exists for hypotension-induced stroke. We looked for hypotension-induced stroke in patients with normal carotids.

Over an 18 month period, all acute strokes underwent prospective screening for presyncope or syncope at stroke onset. Suitable patients were referred to a syncope unit for phasic blood pressure (BP) assessment. All underwent 1.5T MRI acutely while those with suspected borderzone infarction (BZI) underwent repeat 3T MRI with perfusion imaging to confirm BZI. All with severe carotid stenosis were excluded.

During an 18 month period, 456 acute stroke patients presented to St. James Hospital, Dublin. Of these, 22 exhibited presyncope or syncope at stroke onset (4.8% of all strokes). The median carotid stenosis was 20-30% bilaterally and no intracranial disease was detected. The mean age was 74 yrs, 70% were female (n=14). 15 (68%) patients suffered a TIA and 7 (32%) suffered a stroke. All reported hypotensive symptoms for a mean 3.8 yrs and were diagnosed with a hypotensive disorder. 14 of the 22 (64%) patients were diagnosed with vasovagal syncope through symptom reproduction on head-up tilt, 5 (23%) had sustained ortho-
Compliance with Primary and Secondary Preventive Medications in Patients with Cerebrovascular and Acute Coronary events

Y.F.I. Feldman-Idov¹, O.K. Kolpak², S.A. Atar³, B.G. Gross⁴
Western Galilee Hospital, Department of Neurology, Naharia, ISRAEL¹, Western Galilee Hospital, Department of Cardiology, Naharia, ISRAEL², Western Galilee Hospital, Department of Cardiology, Naharia, ISRAEL³, Western Galilee Hospital, Department of Neurology, Naharia, ISRAEL⁴

Background: Poor compliance with medications is a prevalent problem, especially in chronic patients. Wide range of compliance rates were reported with medication treatments for prevention of ischemic vascular events. We aimed to evaluate the compliance rates before and after hospitalization for cerebrovascular or acute coronary event, and to test the differences in compliance between patients with first and recurrent event as well as between patients with cerebrovascular and acute coronary event.

Methods: All patients hospitalized in Neurology and Cardiology departments during March-December 2010 with cerebrovascular or acute coronary event were included. Intake of at least one preventive medication during the month before hospitalization was required. Patients were asked to answer two questionnaires: during index hospitalization and then a telephonic questionnaire 3 months after discharge. Statistical analysis: Logistic regression models adjusted for age and sex were used to test the differences in compliance.

Results: Among the 253 participants with mean age of 64 years, 68.8% were men. The overall compliance with preventive medications increased from 65.9% before hospitalization to 91.2% three months after hospitalization. No differences were found...
Background
Atrial fibrillation (AF) is the most common cause of cardioembolic stroke. Basal ECG and continuous monitoring during the first 24-48 hours is a general recommendation but previous studies suggest low detection rates (4-5%).

Use of implantable cardiac monitors (ICM) may improve the detection of occult atrial fibrillation in cryptogenic stroke with high suspicion of cardioembolic origin.

The present study was undertaken to determine the feasibility and rate of detection of AF in patients with cryptogenic stroke with high suspicion of cardioembolic origin with an ICM (Reveal XT, Medtronic).

Methods
309 consecutive patients admitted to the neurology ward with acute ischemic stroke or TIA were prospectively evaluated by TOAST criteria and vascular neurologists. Patients with age>45 years, Rankin modified scale 0-1, imaging with embolic infarct, negative vascular study (angioMRI and/or transcranial and cervical duplex), negative cardiological workup (daily ECG monitoring, 24h Holter, transthoracic and transesophageal echocardiography) and candidates to anticoagulant treatment were included and ICM was implanted. Follow-up was done monthly follow-up during the first 3 months and then every 3 months.

Results
ICM was implanted in 14 (15%) of patients. The average follow-up was 11’5 months per patient. There were no complications with ICM. In 28% (4) of cases AF was detected during follow-up. Median

Conclusions: Measures should be taken to preserve the high compliance after hospitalization. It should be considered focusing especially on improving compliance with lipid lowering drugs and anti-platelets, particularly in primary prevention.
(24.4%) patients had mitral regurgitation of 1-2 stages, 12 (14.1%) patients had short mezosistolic noise. 10 (11.8%) patients were diagnosed with cerebrovascular disorders: 3 patients had a stroke, 7 patients had developed TIA. All patients had a history of autonomic dysfunction. Objective examination revealed asthenic physique of the marfanovskom type and stigmas of dizembriogeneza. Deficit corresponding to the pool defeat was detected in the neurological status. MRI of brains in the angiography mode revealed that patients with stroke had a focal of infarct in carotid area. Patients with TIA had not any focals. Echocardioscopy revealed the myxomatous degeneration of mitral valve with small clots in patients with stroke. Transcranial Doppler in patients with stroke showed an asymmetry of bloodstream, and an increase of the resistance coefficient the formation of arteriovenous shunts primarily in the CMA. The correlation of EEG data mapping with transcranial Doppler revealed in these patients a focus of pathological activity of the delta range in the area of changes in bloodstream. Treatment of patients included anticoagulants (soludexid) and Phosphocreatine.

Conclusion MVP with the regurgitation and small blood clots in the modified valve leaflets is one of the etiological factors of cardiogenic stroke.

Newly diagnosed atrial fibrillation after cryptogenic stroke: look at age, previous ischemic events and left atrial area!
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Background
A significant proportion of cryptogenic stroke is due to undiagnosed atrial fibrillation (AF). We thus aimed to establish the profile of stroke patients with undetermined aetiology who had developed AF after hospital discharge.

Methods
All patients with ischemic cryptogenic stroke over a one-year period were included (n=141). Newly diagnosed AF (NDAF) was defined as an irregular non-sinus rhythm lasting > 30 seconds detected by either 24-h ambulatory ECG monitoring or 12-lead surface electrocardiogram. Baseline clinical, biological and echocardiographic data of these patients were retrospectively recorded. Independent predictive factors were then used to produce a predictive grading score for NDAF, derived by logistic regression analysis.

Results
Over a median follow-up period of 854 days, 20 NDAF (14%) occurred. The median time to NDAF was 750 days (range: 17-951). In multivariate analysis, factors associated with NDAF were age > 70 years (2 points), history of previous coronary artery disease (1 point) or stroke (1 point) and left atrial area > 15 cm² (2 points; total score ranging from 0 to 6). Patients with a score ≤1 point did not develop AF during follow-up. Furthermore, there was a grading association between total score and rates of NDAF: score 2: 7%; score 3: 14%; score 4: 32%; score 5-6: 67%.

Conclusions
In ischemic cryptogenic stroke, this score could be used to target patients at high risk to NDAF after hospital discharge, a score of 0 strongly pointing to the lack of AF development during follow-up. These results warrant confirmation in prospective studies.

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Prevalence of VS and risk of recurrent stroke in hospitalised patients with acute ischaemic stroke
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Beaumont Hospital / Royal College of Surgeons in Ireland, Dublin, IRELAND
Royal College of Surgeons in Ireland, Dublin, IRELAND
Beaumont Hospital / Royal College of Surgeons in Ireland, Dublin, IRELAND

Background: Transoesophageal echocardiography (TOE)-defined valvular strands (VS) have been associated with acute ischaemic stroke (AIS), but the role of VS as an embolic substrate and possible risk factor...
Risk Factors of Decompression Sickness with Neurological Impairment

M. Sramek¹, A. Tomek², T. Honek³
1 Stroke Center, Regional Hospital Kladno, 2 Charles University, 2nd Faculty of Medicine, Prague, Prague, CZECH REPUBLIC¹, Charles University, 2nd Faculty of Medicine, Prague, Prague, CZECH REPUBLIC², Charles University, 2nd Faculty of Medicine, Prague, Prague, CZECH REPUBLIC³

Background: Decompression sickness with neurological impairment (DCS) is caused by the formation of air bubbles in blood due to the sudden decrease of pressure in tissues and in blood during underwater ascent. Known or suspected risk factors for DCS are the presence of right to left shunt (RLS), body fat, age, fitness, cold, dangerous or reverse dive profile. The aim of our study was to identify particular risk factors and compare their importance.

Methods: We compared two cohorts of divers - 31 divers with DCS and 353 divers without any history of DCS. All divers were examined for the presence of RLS by contrast transcranial doppler sonography (TCD). RLS was assessed as low, medium or high. The divers also filled in a questionnaire about their personal data including age, body weight and height and history of decompression dives.

Results: We recruited 170 patients with AIS. We found VS in approximately half of the patients with AIS (38/78, 48.7%) compared to one-third of controls (29/89, 32.6%). Univariate analysis confirmed an association between the presence of VS and risk of AIS (OR = 3.85, p = 0.05), which weakened following multivariate analysis (OR = 2.15, p = 0.06). The risk of recurrent stroke and survival without poor vascular outcome was not statistically different between cases with or without VS (OR = 1.45, 95% CI 0.30 - 6.96, p = 0.64).

Conclusion: While we found an association between VS and AIS in our case-control study, the strength of the association was reduced after multivariate analysis. We did not confirm an increased risk of recurrent stroke or poor vascular outcome in cases with or without VS. Our findings do not support the embolic potential of VS as a risk factor for recurrent stroke in our sample.

Aims: To measure the prevalence of VS and explore their association with AIS in a case-control study and compare the risk of subsequent poor vascular outcome (vascular events and/or vascular death) in the stroke cohort patients with or without VS in a follow-up study. Methods: In the case-control study, the prevalence of VS was estimated from patients consecutively admitted with AIS and in those who had undergone TOE for reasons other than to rule out a cardioembolic source. Patients with AIS were then followed to assess the risk of poor vascular outcome, including risk of recurrent stroke.

Results: We recruited 170 patients with AIS. We found VS in approximately half of the patients with AIS (38/78, 48.7%) compared to one-third of controls (29/89, 32.6%). Univariate analysis confirmed an association between the presence of VS and risk of AIS (OR = 3.85, p = 0.05), which weakened following multivariate analysis (OR = 2.15, p = 0.06). The risk of recurrent stroke and survival without poor vascular outcome was not statistically different between cases with or without VS (OR = 1.45, 95% CI 0.30 - 6.96, p = 0.64).

Conclusion: While we found an association between VS and AIS in our case-control study, the strength of the association was reduced after multivariate analysis. We did not confirm an increased risk of recurrent stroke or poor vascular outcome in cases with or without VS. Our findings do not support the embolic potential of VS as a risk factor for recurrent stroke in our sample.
Rate of cardiac arrhythmias and silent brain lesions in experienced marathon runners - the Berlin Beat of Running study

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Center for Stroke Research Berlin and Department of Neurology, Charité University Medicine Berlin, Berlin, GERMANY1, Center for Stroke Research Berlin and Department of Neurology, Charité University Medicine Berlin, Berlin, GERMANY2, Center for Stroke Research Berlin and Department of Neurology, Charité University Medicine Berlin, Berlin, GERMANY3, SMS Sports Medicine Berlin, Medical Institute of the BMW BERLIN-MARATHON, Berlin, GERMANY4, SMS Sports Medicine Berlin, Medical Institute of the BMW BERLIN-MARATHON and Department of Sports Medicine, Humboldt-University Berlin, Berlin, GERMANY5, SCC EVENTS GmbH Berlin, Germany Berlin, GERMANY6, Institute of Clinical Epidemiology and Biometry, University of Würzburg, Würzburg, GERMANY7, Center for Stroke Research Berlin and Department of Neurology, Charité University Medicine Berlin, Berlin, GERMANY8, Department of Cardiology, Campus Virchow Clinics, Charité University Medicine Berlin, Berlin, GERMANY9, Center for Stroke Research Berlin and Department of Neurology, Charité University Medicine Berlin, Berlin, GERMANY10, Center for Stroke Research Berlin and Department of Neurology, Charité University Medicine Berlin, Berlin, GERMANY11

Background:
Regular exercise is beneficial for cardiovascular health but a recent meta-analysis indicated a relationship between extensive endurance sport and a higher risk of atrial fibrillation, an independent risk factor for stroke. Data on the frequency of cardiac arrhythmias or (clinically silent) brain lesions during and after marathon running are missing.

Methods:
In the prospective observational “Berlin Beat of Running” study experienced endurance athletes underwent clinical examination (CE), 3-Tesla brain magnetic resonance imaging (MRI), carotid ultrasound imaging (CUI) and serial blood sampling (BS)
within 2-3 days prior (CE, MRI, CUI, BS), directly after (CE, BS) and within 2 days after (CE, MRI, BS) the 38th BMW BERLIN-MARATHON 2011. All participants wore a portable electrocardiogram (ECG)-recorder throughout the 4-5 days baseline study period. Participants will be followed up after one year.

Results:
In total 110 athletes aged 36-61 years were enrolled. Mean age was 48.8 ±6.0 years, 24.5% were female and their mean CHA2DS2-VASc score was 0.3 ± 0.5. Participants have attended a mean of 7.5 ± 6.6 marathon races within the last 5 years and a mean of 16 ± 36 marathon races in total. Their weekly running distance prior to the 38th BMW BERLIN-MARATHON was 65 ± 17 km. Finally, 108 (98.2%) Berlin Beat-Study participants successfully completed the 38th BMW BERLIN-MARATHON 2011. Analyses of brain MRI and of ECG-recordings of all athletes are ongoing and will be presented at the ESC.

Conclusions:
Findings from the “Berlin Beats of Running” study will help to balance the benefits and risks of extensive endurance sport. ECG-recording during the marathon might contribute to identify athletes at risk for cardiovascular events. MRI results will give new insights into the link between physical stress and brain damage.

Trial registration: clinicaltrials.gov NCT01428778

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Cerebral blood flow regulation: different mechanisms for dynamic cerebral autoregulation and vasoreactivity to acetazolamide in carotid atherosclerosis.
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Background and aims:
Cerebral autoregulation and cerebrovascular reactivity to CO2 or acetazolamide in carotid atherosclerosis are generally believed to be influenced by the same factors. In the present study, we examined the relation of several factors with dynamic cerebral autoregulation (DCA) and cerebrovascular reactivity to acetazolamide (CVR-ACZ) in patients with atherosclerotic carotid stenosis or occlusion. Tested factors included degree of stenosis, symptomatic status of carotid and arterial baroreflex sensitivity (BRS).

Methods:
This is a retrospective analysis of consecutive patients with unilateral carotid atherosclerotic stenosis >/=60% or occlusion. DCA was assessed using the correlation coefficient Mx established between spontaneous short term variations of blood pressure...
and cerebral blood flow velocities. Higher Mx values indicate worse DCA.

CVR-ACZ was assessed through increase of mean cerebral blood flow velocities to acetazolamide injection (dVm). Lower dVm indicate worse CVR-ACZ.

Resting BRS was assessed using the sequence method from spontaneous variations of systolic blood pressure and heart rate. Lower values indicate worse BRS.

Results:
Forty patients were included: M/F: 31/9; mean age +/- SD: 65.7 +/- 10.64. 30 patients had stenosis and 10 patients had occlusion. Using multivariate analysis, increased BRS was the only variable associated with worse DCA (p=0.005), whereas higher degree of carotid stenosis was the only variable associated with reduced CVR-ACZ (p=0.04).

Conclusions:
Our study suggests that DCA and CVR-ACZ explore different regulatory mechanisms of cerebral blood flow in patients with carotid atherosclerosis. CVR-ACZ depends on the severity of stenosis whilst DCA depends on the sensitivity of arterial baroreflex. Worse BRS was associated with better DCA. Sympathetic activation associated with altered BRS could explain better DCA through increase in cerebral vasomotor tone.
monitoring had been limited to patients with strokes of unknown etiology despite complete work-up in combination with cortical or subcortical symptoms, the yield of cardiac event monitoring to detect patients with paroxysmal AF would have been 17.2%. Therefore we suggest that it is warranted to use cardiac event recording in this selected group of acute stroke patients.

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**Long-term monitoring for paroxystic atrial fibrillation in cryptogenic stroke: Preliminary Results of the SURPRISE Study**


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Background
The SURPRISE project aims at estimating the frequency and the burden of paroxysmic atrial fibrillation (PAF) in patients after cryptogenic minor stroke or TIA.

Method
An atrial fibrillation sensitive loop-recorder, is implanted subcutaneously, and patients are monitored for up to 3 years and followed up. Primary endpoints of the study are 1) episodes PAF and 2) burden of AFIB. Further 1) persisting AF and 2) recurrent stroke/TIA, and 3) treatment change to anticoagulation based on monitoring events. The study aims at enrolling a total of 100 patients.

Results
Until today (January 13th 2012) we have included 70 patients; 64 are so far implanted.

In 9 patients (14.1%) PAF has been documented on monitoring and patients have consequently been anticoagulated. 1 patient (1.92%) went from PAF to persisting AF
BACKGROUND AND PURPOSE: Contrast-enhanced transcranial Doppler monitoring (c-TCD) is the most sensitive and widely used screening test for the detection to patent foramen ovale (PFO). We aimed to evaluate the diagnostic accuracy of contrast-enhanced transcranial color-coded sonography (c-TCCS) against c-TCD for the detection of right-to-left shunt (RLS).

MATERIALS AND METHODS: Prospective study of consecutive ischemic stroke patients studied at our Neurosonology Laboratory for the presence of RLS between March-2011 and January-2012. All patients underwent c-TCD by contrast injection (9 cc of saline solution + 1 cc of air), both at rest and after Valsalva maneuver (VM). In addition, after 15 minutes of rest, all patients underwent a c-TCCS by a Neurosonographer blinded to the results of the c-TCD, who used the same methodology as in c-TCD. The extent of CDI was measured according to international criteria: absent (no HITS), small (<10 HITS), medium (>10 HITS shower pattern) and large (> 10 HITS, curtain pattern).

RESULTS: Fifty patients enrolled, 23 men. Mean age 43 years old. At rest, c-TCD showed 7 RLS and 6 were detected by c-TCCS. After VM, c-TCD showed 23 RLS and 21 were detected by c-TCCS. Taking into account only medium-large RLS, at rest c-TCD showed 3 RLS compared with 2 by c-TCCS and, after VM, both c-TCD and c-TCCS showed 12 RLS. After VM c-TCCS showed, compared with c-TCD, 21 true-positive, 2 false-negative, 2 false-positive, and 25 true-negative studies: sensitivity 91.3%, specificity 92.6%, positive predictive value (PPV) 91.3%, negative predictive value (NPV) 92.6%.

Conclusion
Paroxystic AF seems frequent in cryptogenic stroke even after telemetry and may occur after a long free interval. Long term monitoring frequently results in change of treatment. Older patients and patients with more risk factors are more likely to have paroxystic AF.

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Validation of transcranial duplex sonography as screening test for the detection of patent foramen ovale
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HAS-BLED is useful in stroke patients with AF in order to detect risk of bleeding.

Methods: We analyzed retrospectively the scores of HAS-BLED and CHADS2 and CHA(2)DS(2)-VASc in 170 patients with AF and stroke in order to know the correlation between the scores. The Spearman rank correlations coefficient was calculated for correlation between CHADS2 score for stroke risk and HAS-BLED for bleeding risk. We stratified the risk of scales in thirds, upper third CHADS2 considering scores 5-6 points and CHA(2)DS(2)-VASc, 7-9; Middle third in CHADS2 considering scores 3-4 and CHA(2)DS(2)-VASc, 4-6 and lower third CHADS2 0-2 and CHA(2)DS(2)-VASc 0-3). HAS-BLED was divided into 0 -2; 3-6 and 7-9. Results: 170 patients with mean age 70.5 years were followed between 1 and 297 months (median 39.9 months). Hypertension was present in 114 pts (67%), There were 102 (60%) women. Only 32 pts were younger than 65 years (19%). Mean score of HAS-BLED scale was 2.80. Mean score of CHADS2 scale was 3.75. Forty-three pts (25%) had HAS-BLED Score ≤ 2 (low risk) with CHADS2 scale between 2 to 4. 122 pts (71%) had HAS-BLED score 3 and 4 with CHADS2 score from 3 to 6 and 5 pts (2.7%) had HAS-BLED scores higher than 4 (Spearman r=.499, P=0.01). Distribution of qualified by CHA2DS2VASC were similar to CHADS2 according to HAS-BLED score (Spearman r=.565. P=0.01). Distribution of patients in each risk of stroke score by thirds was identical in both risk stroke scales. 25% of patients had low risk of bleeding. Conclusion: In our series from patients with stroke and AF, there is a cor-

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Is useful the use of HAS-BLED score in patients with AF and Stroke?
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Background: CHADS2 and CHA(2)DS(2)-VASc scores estimates annual stroke rates for untreated AF patients, which are reduced by 60% with warfarin and by 20% with aspirin. HAS-BLED estimates annual rates of major bleeding on warfarin. Both scales include several of the same items such as hypertension, stroke and age. The purpose of this analysis is to know if
The role of patent foramen ovale in cryptogenic ischemic stroke

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Background: The occurrence of cryptogenic ischemic stroke (CIS) ranges up to 25% of all IS. In these patients, higher presence of patent foramen ovale (PFO) was documented repeatedly. The aim was to assess the occurrence and long-term risk of PFO for recurrent IS in CIS patients aged up to 50 years. Methods: Ninety-one consecutive CIS patients (47 males, mean age 42.0+/−7.5 years) were enrolled in prospective study. CIS was defined according to the TOAST criteria. All patients underwent transesophageal echocardiography including contrast agent administration and provoked Valsalva maneuver. Initial neurological deficit was assessed using National Institutes of Health Stroke Scale (NIHSS) and 90-day clinical outcome using modified Rankin Scale (good clinical outcome was defined as 0–2). Patients were divided into 2 groups according to the PFO presence (Group 1) or absence (Group 2). Results: PFO was found in 27 (28.1%) of patients (12 males, mean age 44.0+/−7.6 years). No difference was found between groups in age and sex distribution, occurrence of arterial hypertension and diabetes mellitus, contraceptives use and clinical outcome. PFO patients had higher initial NIHSS value (median 5.0 vs. 3.5, p=0.033) and lower occurrence of hyperlipidemia (25.9 vs. 51.6%, p=0.0036). Recurrent IS occurred.
in 1.5% of PFO patients and in 3.5% of patients without PFO (p>0.05) with similar mean time to the occurrence of recurrent IS (80 vs. 88 months, p>0.05). No statistically significant difference was found in the number of patients with good 90-day clinical outcome between the respective groups (96.0 vs. 76.6%, p=0.085). Conclusion: According to the results of the presented study, the risk of recurrent IS is low in CIS patients and the PFO presence does not increase this risk. Thus, the indication for endovascular PFO closure should be carefully considered. Acknowledgement: Supported by the IGA MH CR grants NT/11386-5/2010, NT/11046-6/2010 and by the grant CZ.1.05/2.1.00/01.0030.

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POST-STROKE ABNORMAL EATING BEHAVIORS

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Background and aim: Abnormal eating behaviors (AEB) may be secondary to medical disorders and may not include all the three core features typical of primary eating disorders (eating behavior, intention to control weight and body image disturbance); Symptoms may be limited to one of the three core features, and may not reach the frequency and severity of classical eating disorders. AEB can have a significant impact on patient quality of life and nutritional status, and may benefit from proper assessment. Most recent studies on neurologic diseases suggest that cerebral pathology underlies AEB. In this pilot study we aimed to investigate prospectively the presence and correlates of AEB in stroke survivors.

Methods: we studied a sample of 41 patients (Mean age=61.6±9.2; 71% male; 73% ischemic stroke), 4-years after stroke. AEB were assessed by telephone interview, in patients and caregivers, using the items assessing AEB from the Mini International Neuropsychiatric Interview (MINI), Eating Disorders Inventory (EDI-2) and Neuropsychiatric Inventory Questionnaire (NPI-Q). Patients presented AEB if scored in at least one item of the MINI, EDI-2 or in the NPI-Q, and categorized as anorexia-like behavior or bulimia-like behavior. Associations between AEB and demographic variables, stroke type, and outcome at discharge (modified Rankin Scale) were analyzed.

Results: AEB were present in 34 (82.9%) patients (22 (53.7%) scored AEB in the MINI, 28 (68.3%) scored AEB in the EDI-2, 13 (31.7%) scored AEB in the NPI-Q). Of the total of 34 patients, 22 presented anorexia-like behavior, 2 bulimia-like behavior, 8 both behaviors. There were no statistical differences between patients with and without AEB.

Conclusions: In this pilot study, AEB were frequent in stroke survivors. Patients reported post-stroke AEB more frequently
Comparison of clinical-neuroimaging diagnoses and cognitive profile diagnoses of mild cognitive impairment subtypes: preliminary experience in a VAS-COG clinic.

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Background: In our out-patient service dedicated to patients with cognitive and behavioral consequences of cerebrovascular diseases (CVD), the “VAS-COG” clinic, the diagnosis of mild cognitive impairment (MCI) and MCI different subtypes is based on clinical, neuropsychological and neuroimaging aspects (clinical-neuroimaging diagnosis). Winblad et al. [1] proposed subtypes of MCI based on the cognitive profiling (amnestic/nonamnestic; single/multiple domain) (cognitive profile diagnosis) and hypothesized that different pathogenic subtypes are subtended by specific cognitive profiles. According to these criteria, vascular MCI is characterized by a multi-domain profile.

Objective: To compare diagnoses of MCI subtypes based on clinical-neuromaging assessment with Winblad et al.’s [1] MCI subtyping.

Methods: We reviewed the clinical data of 46 MCI patients; clinical-neuroimaging diagnoses were: 9 degenerative-MCI (D-MCI), 25 vascular (V-MCI), and 12 mixed MCI (M-MCI).

Results: In only 23 (50%) patients the clinical-neuroimaging diagnoses resulted concordant with the Winblad et al.’s [1] subtypes; the following were discordant: 5 (55%) D-MCI patients presented a non-amnestic cognitive profile, 4 single domain and 1 multiple domain; 10 (40%) V-MCI were classified as non-amnestic single domain; and 4 M-MCI non-amnestic single domain, based on the cognitive profiling. The remaining V-MCI patients were amnestic MCI multiple domain (n=9, 36%) and non-amnestic multiple domain (n=2, 8%).

Conclusions: With the limitation of the small patient sample, our preliminary study suggests that the cognitive profile of V-MCI is more heterogeneous than previously suggested. In particular considering the Winblad et al.’s [1] MCI classification not all the cases of V-MCI have a multiple domain profile.
Backround and aim: Perception of illness is the process of becoming aware of the illness which enables to organize and interpret the stimuli received into meaningful knowledge. Perception of illness influences patient’s adaptation to the disease and emotional disorders. We aimed to study the frequency and correlates of perception of illness disturbances (PID).

Methods: We studied prospectively consecutive acute stroke patients admitted to a Stroke Unit. We assessed illness perception (Brief Illness Perception Questionnaire), cognition (MMSE), depression (MADRS), denial (Denial Illness Scale) and health perception (EURO-Qol). We categorized PID in absent (total score < 3rd quartile) and present (≥ 3rd quartile), and performed a bivariate analysis with the chi-square test (OR, 95%CI) and t-test comparing PID with demographic variables, clinical data (stroke type, location), stroke severity (NIHSS) at hospital admission and at discharge, thrombolysis treatment, and functional outcome at discharge (modified Rankin Scale).

Results: We assessed 108 patients (Mean age = 64.3 ± 10.5; Men: 70.4%). PID were identified in 25 patients. PID were associated with previous mild cognitive impairment (X2 = 3.9, p = 0.05), depression in acute stroke (X2 = 10.5, p = 0.001), stroke severity at discharge (t = 3.8, p = 0.00) and functional outcome at discharge (X2 = 17.1, p = 0.000). Logistic regression model retained depression in acute stroke (OR = 6.4, 95%CI = 1.9-21.6) as independent predictor of PID.

Conclusion: PID were frequent in acute stroke patients. Acute depression increased the risk of PID.

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Differences of Behavioural and Psychological Symptoms between Small Vessel and Large Vessel Vascular Dementia

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Background: Vascular dementia (VaD) is the second most common type of dementia, only a few small studies on behavioural and psychological symptoms of dementia (BPSD) have been conducted in patients with VaD. We investigate the presence of BPSD in VaD, and to compare the prevalence and severity of BPSD according to type of the vascular dementia.

Methods: BPSD of 77 VaD patients were determined using the 12-item Neuropsychological Inventory (NPI). Based on the operational definitions for the radiological part of the NINDS-AIREN criteria, 42 had small vessel VaD, 35 had large vessel VaD. VaD patients were mildly to moderately demented with a mean MMSE score of 17, and a mean GDS of 4.

Results: BPSD were reported in 73% of the VaD patients. BPSD in patients with VaD according to dementia severity were more common. Apathy (67%) was most common prevalent, followed by depression (52%), anxiety (38%), night-time behavioural disturbance (33%), appetite and eating
abnormalities (33%), and agitation (31%) in small vessel VaD. Apathy (48%), depression (34%), anxiety (34%), irritability (23%), and appetite and eating abnormalities (20%) were common BPSD in large vessel VaD. Small vessel VaD was more common than large vessel VaD in all BPSD items.

Conclusions: Our study shows a high prevalence of BPSD in mild to moderate VaD patients. In particular, apathy, depression and anxiety are common in both small vessel and large vessel VaD. We suggest that disruption of white matter tracts between frontal cortex and basal ganglia is important role for BPSD in VaD.

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Anxiety after stroke; natural history and associations with other health outcomes

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Background: Evidence on the long term natural history, and impact on other health outcomes, of anxiety after stroke is limited. Methods: Data on first ever strokes collected from the population-based South London Stroke Register. 4022 patients were registered between January 1995 and December 2009. Patients were followed up 3 months after stroke and then every year for up to 15 years. Follow up included assessments for anxiety and depression (Hospital Anxiety and Depression Scale. Anxiety or depression subscales scores >7 = anxiety and depression respectively) disability (Barthel Index), cognition (Abbreviated memory test or Mini-mental estate examination) and health related quality of life (SF-12). Multivariable regression models were used to investigate the association between anxiety within a year of stroke and mortality, stroke recurrence, disability, cognitive impairment and quality of life up to 15 years after stroke. Models were adjusted for age, sex, ethnicity, stroke severity (Glasgow coma score, urine incontinence and hemiparesis), disability in the acute phase of stroke, and depression within a year of stroke.

Results: During the 15 years of follow up 59% of the patients had anxiety at some point. Incidence ranged from 15 to 33%, and prevalence from 32 to 58%. 70% of patients with anxiety at any time point were anxious within a year of stroke. 64 to 100% of the patients with anxiety had depression at the same time. Anxiety in the first year after stroke predicts lower quality of life in its mental health domain until year 8 after stroke. However it does not predict the physical domain of quality of life, mortality, disability, stroke recurrence or cognitive impairment.

Conclusion: Anxiety is a frequent problem persistently affecting between one in three and one in two patients up to 15 years after stroke. It also predicts lower quality of life in the long term.
Cerebellum involvement in post-stroke depression: a combined ecological and MRI study

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Introduction
Post-stroke depression (PSD) is associated to a poor functional outcome. PSD is still underdiagnosed due to the absence of clear diagnostic criteria. Complementary information inaccessible to standard hospital-based assessments can be provided by ecological methods such as the Experience Sampling Method (ESM). The aim of the present study was to evaluate the interest of a new approach combining structural MRI and measures of daily-life symptoms in the understanding of PSD pathophysiology.

Methods
Patients with a first ischemic stroke were included. Exclusion criteria were history of psychiatric or neurologic illness, aphasia and visual or motor handicaps preventing adequate use of the ambulatory method. Daily-life symptoms were evaluated using ESM 10 days after stroke. Brain MRI acquisition was performed at 10 days after stroke including DWI, FLAIR, T2* and 3D T1 MPRAGE sequences. A VBM analysis was performed (VBM5, cluster level FWE corrected p<0.01).

Results
12 patients were included (mean age=58+/−13.2, 8 were male). The mean NIHSS was 5.3+/−3. Stroke lesions were widely distributed except on cerebellum. VBM analyses showed a significant positive correlation between the frequency of positive thoughts and the cerebellar grey matter volume including vermis region and both right and left posterior hemispheres.

Conclusion
The present results suggest that morphological brain characteristics, such as cerebellar volume, are associated with the modulation of emotional response following stroke. The cerebellum has reciprocal connections with limbic structures and is functionally associated with resting-state networks that make it a potentially key structure in mood regulation. These results suggest that i) PSD is not only the consequence of stroke lesion but also the expression of underlying phenotypic characteristics and ii) approaches combining ESM and advanced MRI could provide new insights in the pathophysiology of PSD.
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Evaluation of Cognitive Function and Risk Factors in the First 6 months After Ischemic Stroke

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Background and Purpose: Cognitive deficits may significantly worsen the quality of life after stroke. High plasma total homocysteine, has emerged as a risk factor for cognitive decline after stroke. Our aim was to determine: 1. the frequency of vascular cognitive impairment (VCI) and post-stroke dementia (PSD) in a series of previously nondemented patients between the ages of 54 and 79 years at 6 months after a ischemic stroke; 2. the association between Hcy levels, cognitive performance and the development of VCI.

Key Words: ischemic stroke, VCI, PSD, homocysteine, risk factors.

Methods: Over the period of 18 months among 1074 patients who were hospitalized in the inpatient ward of vascular neurology in MHAT Ruse with a diagnosis of ischemic stroke, 56 that met the inclusion criteria were included in the study. All patients underwent a detailed systemic and neurological examination, as well as a clinical interview in an effort to determine the sociodemographic features, and both vascular and non-vascular risk factors of stroke. Routine laboratory examinations and cranial imaging (computed tomography [CT]) were also conducted. The functional, clinical, and cognitive status of the patients were evaluated at the time of hospitalization – 5-th day; 1-st month and 6 month later with NIH Stroke Scale (NIHSS), Mini Mental State Examination (MMSE), Isaacs’ Set Test (IST).

Results: Of the 56 patients included in the study, 16 (28.6%) were diagnosed with vascular cognitive impairment and post-stroke dementia. Multivariate analyses revealed that cognitive and functional status; and elevated Hcy levels during hospitalization predicted the development of VCI and PSD in this group of patients.

Fig.1 showed that the main vascular risk factors are more common in patients with VCI, such as hypertension, diabetes, previous MI, elevated Hcy levels.

Fig.2 showed the results in the assessment of cognitive functions. At 6 months after stroke onset, patients with VCI with significant reduction in the total score for MMSE and IST.
Conclusion: The results corroborate previous findings that VCI is a common complication of stroke and its related risk factors including possible direct association with high Hcy levels. Not only physical handicapping but also cognitive dysfunction after ischemic stroke can adversely influence the long-term survival after adjusting other predictors for stroke mortality. Thus, an early recognition and treatment of VCI as risk factors may effectively reduce the severity of stroke and its impact on the quality of patients’ life.

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Cognitive Profile in Acute Stroke Patients
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The long term cognitive impairment after a stroke is a reality for most of the patients. However the cognitive profile in an acute phase is not well established. The purpose of the present study is to characterize the cognitive profile of our stroke unit patients. From 296 patients admitted to our stroke unit, 160 patients full field our inclusion criteria. All patients were evaluated by a neuropsychologist or a trained psychologist, using our inpatients neuropsychological protocol (O-LOG/C-LOG, clock drawing test and house drawing copy test).

Most of our patients were women, had between 70 and 80 years old and less then 4th grade. 13% of the patients were disoriented. Almost 70% of the patients showed impairment in at least one cognitive domain. Executive function was impaired in 60% and recall in 65%. When considering humour, 25% showed depressive symptoms. Cognitive impairment was present in more than half of the patients. The cognitive profile in an acute phase includes impairment in executive function and recall domains, and depressive symptoms. More research is needed to more clearly define this profile.

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The use of the Montreal Cognitive Assessment (MoCA) test in the acute phase of stroke: a comparative study in 3 stroke units
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Methods: Data concerning the use and applicability of MoCA in patients admitted to 3 stroke units (2 in Europe and 1 in Asia) were pooled and analyzed.

Results: MoCA was administered to 565 patients within 3 weeks of stroke onset. The protocols were quite comparable among the 3 centers, with the main difference being that severe and aphasic patients were not a priori excluded from MoCA administration in only 1 center. The MoCA test was entirely applicable in 528 (93.4%) patients (not applicable in 24 and partially applicable in 13 out of 138 patients in 1 center). The mean NIHSS score on the day of MoCA application was similar among the centers (ranging from 2.57 to 2.78), and the MoCA mean scores ranged from 17.9 to 20.8, showing that cognitive deficits are frequently present in acute stroke patients even when the stroke severity is not high (MoCA cut-off score for cognitive impairment=26).

Conclusions: The MoCA might be proposed as a tool for the brief examination of mild-to-moderate stroke patients and could be implemented among the instruments to be used in stroke units. The value of MoCA as a predictor of post-stroke long-term cognitive decline remains to be further elucidated.

Behavioral disorders and post-stroke dementia


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Background:
Mild cognitive impairment (MCI) is a subtle memory disorder, not matching criteria for dementia. There is evidence for vascular comorbidity, obviously in vascular dementia, but also in other types like Alzheimer’s Disease. Increased carotid Intima-Media-Thickness (IMT) and spontaneous cerebral microemboli have been found more frequently in different types. We hypothesised that ultrasound examination and MRI would detect a high degree of vascular disease, brain injury and degenerative changes in patients with MCI.

Methods:
In cooperation with our memory clinic, 12 patients aged 61 to 77 (median 69 years) with amnestic MCI were referred to our department for neurovascular investigation. All patients underwent ultrasound examination with carotid duplex including IMT measurement, and Transcranial Doppler (TCD) including one-hour emboli monitoring, vasoreactivity measurement and Bubble test. Cerebral MRI for evaluation of vascular and white matter lesions, brain atrophy, hippocampal volumes and Amyloid angiopathy was performed in 11 patients.

Results:
Vascular risk factors were found in 8 patients (67%). 5 patients had atherosclerotic lesions, of which 4 had mild (33%) and one had moderate (8%) carotid stenosis. Distal CCA IMT >1 mm was found in 2 patients (17%), no patient had IMT > 1.11 mm. None of the 10 patients with acceptable bone window (83%) had intracranial stenosis in TCD. Vasoreactivity was low (18%) in one patient (8%). Permanent right-left shunt was found in 4 patients (33%), of which one (8%) showed spontaneous cerebral microemboli. Hippocampal volume reduction was present in 2 patients (17%), and 4 patients (33%) had cortical atrophy. Chronic ischemic changes were found in 4 patients (33%), of which one (8%) also had a cortical infarction and microbleedings. Amyloid Angiopathy was not found.

Conclusion:
We suggest that pure amnestic MCI is less associated with cerebrovascular disease, and may be more consistent with evolving Alzheimer’s Disease.
Background. Acute stroke is associated with a variety of changes affecting both glial and neuronal brain tissue, resulting in the release of specific proteins into the cerebrospinal fluid (CSF). The distribution pattern of CSF biomarkers (CSF-b) in acute stroke has not been well investigated.

Aim. To examine the profile of specific CSF-b in acute stroke and to evaluate their relation to the stroke severity and the degree of white matter lesions (WML).

Methods. Twenty-two patients (age 76.2 +/-6.5) with acute stroke were included 5-20 days after stroke onset. Stroke severity was assessed by using NIHSS. The Wahlund scale was used to evaluate the extent of WML. The concentrations of specific CSF-b of neuro-degeneration (NFL; T-Tau; p-Tau; MBP) and inflammation (YKL40; GFAP; sCD14; MCP-1) were measured. Twenty controls were recruited among age-matched, apparently healthy individuals with no prior anamnesis of stroke.

Results. Between-group comparisons by Mann-Whitney test, showed that NFL (9052.3 +/-1734.6), T-Tau (1588.1 ng/L +/-481.2), and MBP (24.4 ng/L +/-11.1) were increased in stroke compared with controls (321.5 µg/L +/-51.8, p<0.01; 410.5 ng/L +/-44.6, p<0.05; and 0.7 ng/L +/-0.1, p<0.05, respectively). Inflammation biomarkers YKL40 (2651.1 ng/L +/-266.3) and GFAP (4611.8 ng/L +/-1734.6) were higher in stroke compared with controls (1852.5 ng/L +/-184.1; p<0.05, and 649.5 ng/L +/-48.2; p<0.05, respectively). The levels of p-TAU, MCP-1 and sCD14 were similar in the two groups.

No relations were found between CSF-b and the location of WML or NIHSS.

Conclusions. Even if no relation was found between CSF-b and the degree of WML or acute stroke severity, they may still play an important role in the developing of subsequent CNS damage, and their pattern in acute stroke may predict the development of cognitive dysfunction and long-term prognosis after stroke.

375 Behavioral disorders and post-stroke dementia

Telephone (TICSm and telephone MoCA) vs face-to-face cognitive testing in patients with TIA and stroke.


BACKGROUND: Face-to-face cognitive testing may not be possible in large studies. We assessed the performance of the
However, the lack of frontal/executive tasks makes the TICSm less appropriate than the MoCA in patients with vascular cognitive impairment when face-to-face testing is possible. T-MoCA is feasible but telephone testing of complex and/or frontal/executive tasks may be difficult even in elderly patients without overt hearing problems.

376 Behavioral disorders and post-stroke dementia

Is Cognitive Impairment more common after lacunar or cortical stroke?
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Background
Cognitive decline and dementia are common after stroke, but it is unclear if the risk differs between ischaemic stroke subtypes, e.g., lacunar strokes being small might be less likely to affect cognition than more severe, larger cortical strokes. Alternatively, lacunar stroke might cause cognitive decline by association with cerebral small vessel disease.

Methods
We searched Medline and Psycinfo for studies for the incidence of mild cognitive impairment (MCI) or dementia after lacunar or cortical ischaemic stroke. We excluded studies with no measure of cognition, no details of cognition by stroke subtype, or where the confirmation of subtype was by pathology not imaging. Meta-analysis was carried out using a random effects model.
Results
In 18 relevant studies (n=6757), 15 hospital- and 3 community-based, there were 2460 lacunar strokes; 1614 patients had MCI or dementia post stroke. 6 used risk-factor based subtyping, the rest used clinical/imaging features alone. 8 studies performed detailed cognitive testing, but the rest used only the MMSE, R-CAMCOG or ADAS-COG; 2 studies accounted for depression, 1 for pre-morbid IQ (NART) and 9 assessed prior cognitive impairment. Last follow-up was 1 month in 2, 3-12 months in 12 and 1-2 years post stroke in 7 studies. Overall, 668/2253 (29%) of lacunar strokes and 946/4127 (22%) of cortical strokes had MCI or dementia up to 1 year post stroke, OR 0.73 (95%CI 0.43-1.22); and 542/2130 (25%) lacunar and 748/3896 (19%) cortical stroke patients had post stroke dementia (OR 0.73, 95%CI 0.41-1.29). There was no variation with time to testing, age, whether previous dementia or recurrent stroke was included, cognitive test or stroke subtyping method.

Conclusion
Up to 25% of patients with lacunar stroke develop cognitive impairment post stroke, a similar proportion to cortical stroke, but long term data were sparse, subtyping was suboptimal and few studies accounted for depression or pre-morbid IQ.
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BACKGROUND:
Hypertension and the presence of silent cerebrovascular lesions (SCL) are associated with an increased risk of stroke and dementia. Although hypertension is also a risk factor for mild cognitive impairment (MCI), the prevalence of MCI in hypertensive Mediterranean patients is unknown. Our objectives are to determine the prevalence of MCI in a Spanish hypertensive population, to study their associated factors and to evaluate the relationship between cognition and SCL.

METHODS:
Prospective observational study in 1000 participants aged 50-70 years, with essential hypertension and no prior history of stroke or dementia. Patients have been randomly selected from 14 primary care centres in Barcelona. On baseline, demographic and clinical data have been recorded and the presence of cognitive impairment has been evaluated by means of a screening test (Dementia Rating Scale-2, DRS-2) and further neurological and neuropsychological examination in suspected MCI participants. A brain MRI was performed to assess for the presence of silent cerebrovascular lesions, including infarcts, white matter changes (WMC), microbleeds and enlarged perivascular spaces. Patients will be followed up annually for at least 3 years.

RESULTS:
Currently 800 patients have been enrolled (54% female, mean age 63 years). Participants with less education and older (both p<0.001) had worst cognitive performance than more educated and younger patients and up to 18% of them showed adjusted scores below normal, suggesting cognitive impairment. Grade 3 hypertension (p<0.001) and subcortical or multiple infarcts (both p=0.058) were associated with lower memory score. Increasing WMC was associated with poor memory and initiation scores. We will discuss other cognitive findings.

CONCLUSION:
Severe stages of hypertension and silent infarcts and WMC are associated with poorer cognitive performance. Cognitive assessment in hypertensives could improve their risk stratification and preventive strategies.

378 Experimental studies

Upregulation of guidance molecule pair Delta-like-4/Notch-1 after mild cerebral artery occlusion
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Background

The fundamental requirement of Delta-like-4(Dll4)-Notch1 molecules during vascular development has been shown in past. Recent studies also suggested their role in tumor angiogenesis, thereby enhancing tumor vascular function. However, the role of Dll4-Notch1 in poststroke angiogenesis and recovery is still unclear; this ligand-receptor pair may represent as a target for pro-angiogenic therapy after stroke. Our aim was to conduct the temporal expression profiling of Dll4/Notch1 molecules after mild ischemic stroke and also to get insight on the cell-type distribution pattern of this ligand-receptor pair.

Methods

Eight-week-old C57BL/6 mice underwent 30 minutes transient middle cerebral artery occlusion via intraluminal suture technique. The sham-operated animals (controls) underwent the same surgery except the occlusion of the artery. Brain was harvested after 24 h, 72h, 7 days, 14 days and 28 days post-stroke reperfusion. Time course post-stroke expression analysis was conducted using real-time PCR and immunofluorescence.

Results

The infarct hemisphere was compared with the corresponding hemisphere of sham-operated animals. The mRNA expression of both Dll4 and Notch-1 are up regulated in the infarct hemisphere after 24h post-stroke. Dll4 stays upregulated at least for 7 days, whereas Notch1 remains slightly elevated for 28 days post-stroke. The increased expression of Dll4 on blood vessels in infarct and peri-infarct region is observed, whereas neuronal cells mainly express Notch1.

Conclusion

Stroke induces the changes in expression of both Dll4 and Notch1. The early and continuous upregulation of both Dll4 and Notch1 molecules in the infarct hemisphere implicates the possible role of Dll4/Notch1 in angiogenesis and tissue repair.

379 Experimental studies

Blockade of kininogen protects from ischemic stroke by combined anti-inflammatory and anti-thrombotic mechanisms

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Background: Inflammation, edema formation and thrombosis are prominent features of ischemic stroke. Activation of the kallikrein-kinin-system (KKS) triggers inflammatory processes and increases the permeability of the blood-brain-barrier (BBB) upon stroke while the intrinsic coagulation cascade contributes to thrombus formation. Kininogens (KNG) are the inactive precursors of the proinflammatory kinins and are important components of both the KKS and the plasmatic coagulation. We investigated the role of KNG in a model of acute ischemic stroke.

Methods: KNG knockout and wild-type mice were subjected to middle cerebral ar-
tery occlusion (MCAO) followed by 24h of reperfusion. Infarct volumes were calculated from histological brain sections and neurological scores were assessed. MRI was used to follow infarct development over time. The expression of tight junction proteins and Evan’s Blue tracer were used as markers of BBB leakage. The local inflammatory response was determined by real-time PCR and immunohistochemistry and thrombosis was analyzed by Western blot.

Results: KNG-deficient mice developed significantly smaller brain infarctions (P<0.0001) and less severe neurological deficits (P<0.0001) on day 1 after MCAO compared to controls and this protection was preserved at later stages of infarct development, i.e. day 7. The risk of intracerebral bleeding remained unchanged after blocking of KNG. Reconstitution of KNG knockout mice with human KNG restored the susceptibility for ischemic brain damage. Mechanistically, the inhibition of KNG reduced BBB damage, inflammation and intracerebral thrombus formation after stroke.

Conclusion: KNG is critically involved in the pathophysiology of ischemic stroke via the activation of inflammatory and thrombotic circuits. Blocking of KNG could become a promising and safe option to combat this devastating neurological disease.

380 Experimental studies

Comparison of Incidence of Aspirin Resistance between optical platelet aggregometer and Point-of-Care devices for evaluation of platelet function in Acute Ischemic Stroke

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Backgrounds: Aspirin resistance (AR) in platelet function test showed a quite variation according to the subjected population and methods to evaluate it. The multiplate analyzer, a kind of point of care methods, have been interested in residual platelet activity after using anti-platelet agents. However, there has been a limited number of data about comparisons of multiplate analyzer with other platelet function tests including optical platelet aggregometer and VerifyNow in patients with acute ischemic stroke receiving aspirin. Methods: In this study, we prospectively evaluated residual platelet function by using optical platelet aggregometer, VerifyNow, and multiplate analyzer in 105 patients with AIS from May. 2010 to Mar. 2011. Each test delineated the aspirin sensitive and resistance group according to the pre-determined its criteria. Also, investigated the variation of aspirin resistance and its concordance rate among three plate function tests. Results: After 5 days of using aspirin, the incidence of AR was 24 patients (22.9%) in optical platelet aggregometer, 14 (13.3%) in VerifyNow, and 15 (14.3%) in multiplate analyzer.
In optical platelet aggregometer, aspirin monotherapy (p=0.003) and first attack of ischemic stroke (p=0.02) were related with the occurrence of AR. In multiple analyzer, AR was significantly higher in women than men. Values of platelet function evaluated by optical platelet aggregometer were not correlated with those of VerifyNow or multiplate this analyzer. However, between the multiplate analyzer and VerifyNow, good agreement was found in patients with AIS. Regarding on the concordance rate of occurrence of aspirin resistance among three tests, there was little difference of its occurrence between VerifyNow and multiplate analyzer (k=0.72, p<0.01). However, its rate was quite low between optical platelet aggregometer and multiplate analyzer.

Conclusions: In this study, the incidence of AR might be highly test specific in AIS. Multiplate analyzer seemed to be a similar platelet function test with the VerifyNow, a kind of POC system. Further study will be needed to define the AR in AIS by using various platelet function tests.

381 Experimental studies

Pimonidazole quantification of ischemic impact after experimental stroke and remote postconditioning increasing middle cerebral artery reperfusion by PKC-alpha activation
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Background: We have used pimonidazole for quantitative western blotting of ischemic load in a rat model of reversible middle cerebral artery occlusion (MCAO) treated with remote postconditioning.

Method: MCAO was conducted in Wistar rats for 5, 15, 30, or 60 min followed by 120 min of reflow; 30 min before MCAO rats had 100 mg/kg pimonidazole ip. Other pimonidazole rats with 60 min MCAO had 3x15 min intermittent hind limb ischemia immediately after reflow and 24 h survival. Finally, rats without pimonidazole had 60 min MCAO and early remote postconditioning followed by 30 min, 24 h, or 48 h of reflow before their occluded and contralateral MCA’s were taken for western blotting of various protein kinase C’s (PKC) and stress kinases.

Results: First, we demonstrated a relationship between pimonidazole binding and time of ischemia. Then we showed a significant reduction in pimonidazole binding in the infarcted hemisphere, when rats had early remote postconditioning. This procedure of early remote postconditioning is known to reduce infarct size and improve reperfusion. Finally, at 24 h of reflow the MCAs showed increases in pPKC-alpha with concomitantly increased levels of pp38 in response to conditioning.

Conclusion: We demonstrate that pimonidazole western blotting can be used for quantifying ischemic impact in experimental stroke even after very short survival times. This measure is reduced in response to early remote postconditioning. We suggest that conditioning activates the mitochondrial ATP-sensitive potassium channel, which, possible via reactive oxygen spe-
cies, activates pPKC-alpha and pp38 inducing “calcium sparks”. These sparks open up the plasma membrane potassium channels resulting in hyperpolarization and vasodilation in the conduit middle cerebral arteries.

## 382 Experimental studies

### Modulation of angiotensin-(1-7) on NF-κB and its downstream proinflammatory cytokines in the cerebral ischemic-reperfusion injuries of rats

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Objective: To investigate the regulative effects of Angiotensin-(1-7) on NF-κB activation and the productions of downstream proinflammatory cytokines. Method: Forty-two male Sprague-Dawley rats were randomly divided into sham group, control group and Ang-(1-7)-treated group (14 rats in each group), cerebral ischemia was induced by the middle cerebral artery occlusion (MCAO) method in control group and Ang-(1-7)-treated group. The sham group and control group were infused artificial cerebrospinal fluid (aCSF, 0.5μL/h) while Ang-(1-7)-treated group were infused Ang-(1-7)( 100pmol,0.5μL/h) into lateral ventricle by implanted osmotic minipumps following MCAO. At 24-h after MCAO, all rats were sacrificed to be detected the expression of NF-κB p65 subunit in neurocyte-nuclei of the ischemic cortex with western blotting way. The spatial distribution of NF-κB p65 subunit in ischemic cerebral tissue was detected by immuno-histochemical assay. The concentrations of TNF-α and IL-1β in serum were detected by ELISA. Results: Treated rats with Ang-(1-7) could significantly reduce the nuclear translocation of NF-κB p65 in the ischemic cortical cells (P<0.05) and lower the serum levels of TNF-α and IL-1β (P<0.05) in the 24h after MCAO. Conclusion: Ang-(1-7) could attenuate inflammatory reaction following cerebral ischemia, perhaps by interacting with Mas receptor or through the antagonism against the pro-inflammatory effect of Ang II.

## 383 Experimental studies

### Effects of the PPAR-α agonist fenofibrate on acute and long-term consequences of brain ischemia

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beneficial effects in terms of the immediate post-stroke consequences by mechanisms involving the interactions between polynuclear neutrophils and the vessel wall and microglial activation. Fenofibrate also prevents the long-term motor and cognitive consequences by interaction with mechanisms involved in neurorepair, in particular neurogenesis and physiopathological pathways involved in dementia such as amyloid cascade.

Conclusion: Our results underline that the PPAR-alpha agonists could be a disease-modifying drug for stroke.

### 384 Experimental studies

**Protective effect of L-theanine in the rat model of focal cerebral ischemia**

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**Objective.** The study was aimed at the assessment of protective effect of Theanine
administration in the rat model of focal cerebral ischemia 30 min before ischemia as well as 3, 12, and 24 hours after ischemia. Materials and methods. The experiments were performed on anesthetized male rats weighting 200-250 g. Focal ischemia was induced by endovascular filament occlusion of middle cerebral artery. Theanine was administered intraperitoneally. The animals were randomized into 6 groups: 1. Controls (30-min ischemia + 48 h reperfusion, n = 8); 2. Theanine at a dose of 1 mg/kg 30 min prior to ischemia (n = 8); 3. Theanine at a dose of 1 mg/kg 3 h after reperfusion (n = 7); 4. Theanine at a dose of 4 mg/kg 3 h after reperfusion (n=6); 5. Theanine at a dose of 4 mg/kg 12 h after reperfusion (n=11); 6. Theanine at a dose of 4 mg/kg 24 h after reperfusion (n=5). 48 h after reperfusion, neurological deficits were evaluated according to Garcia score. At baseline all animals were scored 18; maximal neurological deficit – 3. The extent of cerebral edema was estimated according to coefficient of asymmetry, and cerebral infarct size was determined by staining with 0.1% 3,4,5-triphenyltetrazolium chloride. Results. Administration of Theanine 30 min prior to ischemia, as well as 3 and 12 h after reperfusion resulted in significant reduction in infarct size (p<0,05), amelioration of neurological deficits and brain edema in comparison to controls. The effect of Theanine was dose-dependent since the extent of neuroprotection was greater when the dosage of the drug was increased from 1 mg/kg to 4 mg/kg (p<0,05). When the drug was administered 24 hours after reperfusion all parameters were not different from controls.

Conclusions. Administration of Theanine at a dose of 1 and 4 mg/kg 30 minutes prior to ischemia as well as at 3 and 12 hours after reperfusion causes dose-dependent neuroprotective effect. When Theanine treatment was initiated 24 hours after reperfusion was not effective.

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Cortical ischemic injury induce the damage of central dopaminergic neuronal activity in animal model
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Background: Ischemic brain injury induced impairment of brain homeostasis and neurotransmission and manifested in alterations in the levels of neurotransmitters and neurotransmitter receptors. Dopamine was the first neurotransmitter identified to play a role in ischemic damage. Several studies showed that there be therapeutic advantage in treating stroke with drug which stimulates central dopaminergic receptors. However, it is not established that which particular dopaminergic neurons are involved after stroke. Therefore, the purpose of the present study was to evaluate the effects of cortical ischemic injury on the dopaminergic nerve system in the brain.
Methods: Male Sprague-Dawley rats were randomly assigned to one of three groups; control normal, stroke, stroke with apomorphine treatment. Cortical infarcts were produced by focusing light on the sensorimotor cortex in Rose Bengal-treated rats. To evaluate the effect of stroke in dopaminergic system, we performed apomorphine test, locomotion behavior test and immunohistochemical study.

Results: The apomorphine test showed positive results in the stroke groups. The locomotor activity test showed decreased resting time and increased path length and average speed with apomorphine in the stroke group. The stroke groups showed significantly decreased TH expression in the periaqueductal area, arcuate hypothalamic nucleus, substantia nigra pars compacta, ventral tegmental area, and olfactory bulb.

Conclusion: In the present experiment, we suggest that cortical ischemic injury can damage the dopaminergic nerve system in brain and affect the degree of neurological deficit during a stroke. These results consider as background evidence of dopaminergic strategy for stroke recovery.

Background: Activation of the hypoxia inducible factors (HIF) pathway confers protection against ischemia / reperfusion injury and can be induced by inhibition of the HIF prolyl-4-hydroxylase enzymes (PHD1-3).

To successfully apply PHD inhibitors for neuroprotection in ischaemic stroke, the precise function of each PHDs (1-3) were investigated using mice with each isoform genetically suppressed.

Methods: Male, 8-12 week old PHD1-/-, PHD2+/- and PHD3-/- mice and their wild type (WT) littermate were subjected to 45min of middle cerebral artery occlusion (MCAO). During the experiments, regional cerebral blood flow (rCBF) was recorded by laser Doppler flowmetry. Behaviour was assessed at both 2h and 24h after reperfusion with a common neuroscore. Infarct volumes, blood brain barrier (BBB) disruption, cerebral vascular density, and apoptosis were then determined using histological and immunohistochemical techniques.
Results: When compared to their WT littermates, PHD2+/− mice had significantly increased cerebral microvascular density and more effective restoration of CBF when the occlusion was reversed, PHD2+/− mice showed better functional outcomes and higher activity rates at both 2h and 24h after MCAO, there were significantly fewer apoptotic cells in the penumbra and less BBB disruption, with a trend towards reduced infarct volume at 24h after MCAO; PHD3−/− mice had impaired rCBF upon early reperfusion but comparable functional outcomes; PHD1−/− mice had statistically non-significant reductions in infarct volumes following MCAO.

Conclusion: Genetic inhibition of PHD enzymes produce different effects on outcome after transient cerebral ischemia. These need to be considered in optimizing therapeutic effects of PHD inhibitors, particularly when isoform specific inhibitors become available.

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Systemic inflammation impairs cerebral blood flow after focal cerebral ischaemia

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Introduction

Inflammation contributes to tissue damage resulting from cerebral ischaemia, and studies show that pre-existing infection or inflammation worsens stroke outcome. Experimental work has shown that systemic inflammation exacerbates ischaemic damage via interleukin-1 (IL-1) dependent pathways. Preliminary data using magnetic resonance imaging (MRI) suggest that systemic IL-1 may influence cerebral blood flow (CBF) following reperfusion. The present study aimed to investigate effects of systemic IL-1 on CBF during early reperfusion in experimental stroke. Methods

Transient focal cerebral ischaemia (60min) was induced in male wistar rats by intraluminal filament occlusion. Animals received intraperitoneal recombinant IL-1β (4µg/kg; n=8) or vehicle (0.5% BSA in PBS; n=8). Animals were transferred to a 7-Tesla magnet and remote filament reperfusion performed. Repeated multi-slice diffusion weighted and perfusion (arterial spin labelling) MRI was performed until 4h reperfusion. Diffusion-perfusion mismatch was used to define penumbra and apparent
diffusion coefficient (ADC) maps to define ischaemic damage. At 4h reperfusion animals were perfused, organs removed and brains fixed. Results IL-1 significantly increased ischaemic volume at 3 and 4h reperfusion compared to vehicle-treated animals (P<0.01). IL-1 significantly increased the area of perfusion deficit versus vehicle at 15min (69+/−29mm3 vs. 20+/−7mm3, P<0.001), 60min (66+/−23mm3 vs. 22+/−8mm3, P<0.001) and 120min (46+/−12mm3 vs. 20+/−8mm3, P<0.01) reperfusion. At 15 and 60min reperfusion there was significantly larger penumbra in IL-1 versus vehicle-treated animals (P<0.01).

Conclusions
These results show that IL-1 exacerbates ischaemic damage after transient focal ischaemia and suggests this injury is mediated by an IL-1 dependent reduction in CBF despite reperfusion. These results indicate that patients with pre-existing inflammation could benefit from treatment with IL-1 antagonists alongside thrombolysis.

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Epigenetics of ischemic stroke subtypes.

Background: Epidemiological data provides evidence for a high heritability and probable substantial genetic component to ischemic stroke. However, the epigenetic role is still largely unknown. Epigenetics mechanisms, such as DNA methylation, regulate high-order DNA structure and gene expression. Global methylation changes over time, and has been associated with aging processes and with cardiovascular disease, relating a global hypomethylated DNA to a higher risk of ischemic heart disease and stroke. Our purpose was to determine possible differences in the epigenetic component between ischemic stroke subtypes.

Methods: We included 369 ischemic stroke patients from Hospital del Mar, Barcelona, of three stroke etiologies: atherothrombotic (95), cardioembolic (145) and lacunar (129). All individuals were assessed by a neurologist, recording clinical and epidemiological data and obtaining consented whole blood samples. We quantified global DNA methylation by luminometric methylation assay (LUMA) on DNA blood samples of: univariate and multivariate statistical analysis were carried out. Adjust-
ment variables included age, gender and leukocyte count.
Results: No significant differences were found between methylation and ischemic stroke etiologies (atherothrombotic 72.2%, cardioembolic 72.1% and lacunar 71.4% of methylation, p=0.54). Moreover, no significant differences were found between stroke risk factors analyzed such as, hypertension, diabetes, hyperlipidemia, coronary artery disease, atrial fibrillation, smoking habit, alcohol abuse and prognosis.
Conclusion: Our cohort of ischemic stroke patients does not show differences in global DNA methylation among subtypes of stroke.

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Pharmacokinetics of Progesterone, a Potential Neuroprotectant in a Mouse Stroke Model
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Background
Progesterone is a potential neuroprotectant following experimental cerebral ischaemia. However, detailed pharmacokinetic profiles have not been established.
Method
Male C57 Bl/6 mice were administered progesterone (8 mg/kg, dissolved in dimethyl sulfoxide) via intraperitoneal (i.p.) injection, or via bolus i.p. injection then subcutaneous administration via osmotic mini-pump implantation. Mini-pump reservoirs were filled with progesterone (50 mg/ml, dissolved at 37°C in dimethyl sulfoxide) and had an infusion rate of 1.0 µl/hr. Plasma and brain samples were collected over a period of time of 24hrs (i.p. bolus injection) and 48hrs (mini-pumps with loading dose). Progesterone concentrations were measured by an enzyme immunoassay kit and pharmacokinetic profiles constructed.
Results
Progesterone injected i.p. was modelled using a two compartmental model comprising a fast and slow component. Plasma half-life for the fast component was 0.2 hr with 96% elimination, and 23.1 hr for the slow component. In brain, the fast component half-life was 0.2 hr with 96% elimination, and 2.3 hr for slow. The maximum concentration of progesterone plasma and brain was, respectively 110.28 ng/ml and 268.27 ng/g, both occurring at 15 minutes. Differences in time point concentrations was also found (p<0.001). Mini-pump delivery resulted in higher concentrations of progesterone in both plasma and brain, as compared to i.p. alone (p<0.001). The volume distribution in i.p. injected mice was 172.78 ng/hr/g as compared to 1641.84 ng/hr/g in mini-pump implanted mice over the first 24hrs.
Conclusions
Progesterone should be administered as a loading dose followed by continuous delivery, to maximise brain delivery.

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Cognitive decline in mild cerebral ischaemia: the role of synaptic failure
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Under normoxic conditions responses from directly stimulated neurons (steep part of red curve, figure 1a) are followed by responses of neurons which make polysynaptic contacts with the stimulated ones (slow wave part of red curve, figure 1a). During and after hypoxia, the second (slow wave) part of the curve disappears, reflecting synaptic failure, with preserved direct neuronal responses (figure 1b). Neurons were microscopically undamaged (figure 2).

Conclusion
In a cultured network of cortical neurons, transient hypoxia causes selective synaptic failure of individual neurons. In chronic mild cerebral ischemia or hypoxemia, synaptic failure may play a role in the emergence of cognitive decline.
Introduction: Although cerebral ischemia induced by stroke has been regarded as the important problem worldwide, the therapeutic efficacy is still inadequate. Since the free radicals are implicated in the pathophysiology of cerebral ischemia, the prophylactic protection against stroke with neuroprotective agent possessing antioxidant effect has gained much attention.

Objective: This study was designed to determine whether the alcoholic extract of Passiflora foetida, a plant possessing antioxidant activity, could protect against brain damage and impairment in the cerebral ischemia induced by the occlusion of middle cerebral artery occlusion (MCAO).

Methods: Male Wistar rats, weighing 300-350 g, were orally given the extract once daily at doses of 25, 100 and 400 mg/kg BW at a period of 2 weeks before and 3 weeks after the occlusion of right middle cerebral artery (MCAO). The animals were assessed the cerebral infarction volume at 24 hr after occlusion while the neurological score and % of foot withdrawal reflex in respond to mechanical stimuli were performed after single dose and every day throughout the experimental period.

Results: Rats subjected to P.foetida at dose of 25 mg/kg BW significantly decreased brain infarct volume both in cortical and subcortical structures. The increasing doses further to 100 and 400 mg/kg BW could produce the significant reduction only in cerebral cortex. In addition, it was found that the plant extract could enhance neurological score and improved sensory response to both mechanical and temperature stimuli.

Conclusion: The current study clearly demonstrates the neuroprotective effect of P.foetida. Therefore P. foetida may provide the advantage as functional food to protect against cerebral ischemia induced by stroke. However, further researches about possible active ingredient and the precise underlying mechanism are still necessary.

Key words: Passiflora foetida, neuroprotective, cerebral ischemia

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Dabigatran anticoagulation does not increase hemorrhagic transformation in an experimental model of ischemic stroke

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Background – For more than five decades, warfarin has been the only oral anticoagulant on hand for stroke prevention in patients with atrial fibrillation. It harbours considerable limitations like frequent coagulation monitoring and multiple food-drug interactions. Dabigatran etexilate (DE), is a new oral direct thrombin inhibitor which has been licensed for stroke prevention. Results of clinical trials point towards a favourable risk-to-benefit profile, especially concerning the risk of intracranial hemorrhage. The aim of this study is to evaluate whether hemorrhagic transformation (HT) occurs after experimental stroke under DE treatment as it has been shown for warfarin. 

Methods – 30 male C57BL/6 mice were pretreated orally with 37.5 mg/kg DE, 75 mg/kg DE or saline and dTT and DE plasma concentrations were monitored. Ischemic stroke was induced by transient middle cerebral artery occlusion (tMCAO) for 1h or 3h. We assessed functional outcome and HT blood volume 24 h after MCAO. Results – In mice treated with 1 h tMCAO, HT blood volume did not differ significantly between those pretreated with DE 37.5 mg/kg and controls (1.5 ± 0.5 µl vs. 1.8 ± 0.5 µl, p > 0.05). After 3 h tMCAO, DE-anticoagulated mice did also not show an increase in HT, neither at the dose of 37.5 mg/kg nor at 75 mg/kg (1.3 ± 0.9 µl vs. 1.8 ± 0.8 µl vs. control 2.3 ± 0.5 µl, p > 0.05). Functional outcome at 24 h after tMCAO did not show significant differences between DE treated mice and controls. Conclusion – Our experimental data suggest that DE does not significantly exacerbate hemorrhagic transformation during transient focal cerebral ischemia in mice. From a translational viewpoint, this indicates that a continuation of DE anticoagulation in case of an ischemic stroke might be safe, but clearly, clinical data on this question are warranted.

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Low Platelet Response to Clopidogrel in Minor Stroke and TIA - Impact of Glucose Metabolism

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Background: High platelet reactivity despite treatment with Clopidogrel or ASA is well-known in cardiology and increases the risk for new vascular events by a factor 3-4 in meta-analyses. Diabetes increases platelet reactivity and is a risk-factor for low response to Clopidogrel. After the PRoFESS-study, Clopidogrel is increasingly used as secondary prevention after ischemic stroke and TIA. This work studies the prevalence of low response to Clopidogrel and its relation to glucose metabolism in patients with minor stroke and TIA.

Methods: Patients were recruited from Danderyds Hospital within the ongoing Stroke-Diabetes study. The study was observational and secondary prevention was prescribed according to present guidelines. Platelet reactivity was measured by the Multiplate Electrode Aggregometry in whole-blood. Platelets were activated by ADP to evaluate the effect of Clopidogrel. Low response
ischemia using immunohistochemistry and protein levels in ischemic brain. Thrombin mediates neurovascular damage during stroke. Thrombin inhibition with the direct thrombin inhibitor argatroban reduced all measures of cytotoxicity. We sought to determine whether argatroban showed neuroprotection in a standard behavioral assay.

Methods- Focal ischemia was induced by middle cerebral artery occlusion (MCAo) with a suture for varying durations in adult Sprague Dawley rats (n=29). At random, half the animals received intravenous argatroban 6.25mcg/kg/min or saline for 24 hours beginning at ischemia onset using an osmotic pump (Alzet 2011D). Using a version of the Bederson rodent rating scale, each animal was classified as normal or abnormal 48 hours later. Lesion volume was quantified from TTC stained sections. A quantal bioassay was used to assess outcome, fitting the logistic function to the behavioral ratings (Zivin and Waud, Stroke. 1992;23:767-773).

Results- Using the quantal bioassay, the ED-50 (MCAo duration rendering half the animals abnormal) for the saline control group (n=14) was 19.4 +/- 3.74, compared to argatroban (n=15) 56.4 +/- 11.54min, a highly significant result (P<0.01, independent samples t-test). Lesion volume fractions are shown in the graph. Mean +/- SE volume fraction after saline was 22.44 +/- 7.7 and after argatroban 4.0 +/- 1.8 (p=0.01, t-test)

Conclusion- The thrombin inhibitor argatroban proved highly neuroprotective using the quantal bioassay and routine TTC histology when begun immediately after ischemia onset. These data support our

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Neuroprotection with a direct thrombin inhibitor
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Background and Purpose- Thrombin mediates cytotoxicity after intracerebral hemorrhage and we have shown activated thrombin co-localizing with neurons after to Clopidogrel was defined as more than 468 aggregation units/min according to the Consensus document from American College of Cardiology. Glucose metabolism was evaluated by Oral Glucose Tolerance Tests (OGTT) in patients without known diabetes and classified as normal, impaired glucose tolerance (IGT) or diabetes (DM). Multiplate and OGTT data from the follow-up visit at one month were used, to avoid transient effects in the acute phase.

Results: Of 63 patients on Clopidogrel, 12 (19 %) were classified as low responders. DM was seen in 17 patients and IGT in 15. DM and IGT were more common for low responders (10/12= 83 %) than for responders (22/51=43%). Of those with pathological OGTT, 31 % were low responders.

Conclusions: Low response to Clopidogrel as measured by Multiplate is common in patients with minor stroke and TIA, affecting 1/5 patients, and almost 1/3 of those with IGT or diabetes. Measurement of platelet reactivity opens the possibility for individualized treatment in this high risk group.
prior findings that thrombin is highly cytotoxic during ischemia. Further studies must examine later, more clinically relevant, treatment times.

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**Pre-stimulation of mesenchymal stem cells with growth factors increase their neurorepair effects in cerebral ischemia.**


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Background: Both mesenchymal stem cells (MSCs) and growth factors such as VEGF and GM-CSF play an important role in neurorepair processes. Therefore, our aim was to study the neurorepair effects of pre-stimulation of MSCs with VEGF and GM-CSF in rats subjected to ischemia by occlusion of the middle cerebral artery (MCAO).

Methods: We used Wistar rats (350-375 g) (n=48) submitted to ischemia by intraluminal transient (90 min) MCAO. After ischemia, rats were randomized into 8 groups (each of n=6) treated with: 1) control group (saline); 2) VEGF group (rVEGF 50 µg/kg); 3) GM-CSF group (rGM-CSF 50 µg/kg); 4) VEGF+GM-CSF group (rVEGF at 50 µg/kg plus rGM-CSF 50 µg/kg); 5) MSCs group (1x106 cells/injection); 6) MSCs+VEGF group (1x106 pre-stimulated cells/injection); 7) MSCs+GM-CSF group (1x106 pre-stimulated cells/injection); 8) MSCs+VEGF/GM-CSF group (1x106 pre-stimulated cells/injection). All treatments were intravenously administered at 24 hours after MCAO. MSCs were pre-stimulated in vitro during 24 hours with rVEGF (50 ng/mL), rGM-CSF (100 ng/mL), and rVEGF plus rGM-CSF (50 + 100 ng/mL, respectively). To evaluate the neurorepair effects we analyzed infarct volume, which was measured by MRI at 24 and 72 hours (h) and at 7 and 14 days after ischemia. In addition, functional recovery was assessed using the cylinder test and histology was performed on all cases to evaluate synaptogenesis, neurogenesis and angiogenesis.

Results: We observed that infarct volume was significantly reduced at 7 and 14 days after MCAO in all treated groups compared to the control group (all p<0.0001). However, MSCs+GM-CSF and MSCs+VEGF/GM-CSF treated rats showed a reduced infarct volume (Fig.1) and a significant functional improvement at 14 days after MCAO compared to the other groups (all p<0.05). On the other hand, histological evaluations confirmed enhanced synaptogenesis, vessel density and increased proliferation of progenitor cells in these pre-stimulated cell-
treated animals (all $p<0.05$).

Conclusion: These results suggest that the pre-stimulation of MSCs with growth factors enhance their neurorepair effects in cerebral ischemia.

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What Score should be used by Neurologist in Patients with Stroke and AF.
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Background and Purpose: Stratification of stroke risk in patients with AF is very important mainly as primary prevention measure. Most physicians use CHADS2 score but recently CHA(2)DS(2)-VASc score has been proposed for clinical use particularly in patients with low risk of stroke. The objective of this study is to analyze the role of both scores in patients with stroke and AF in order to find advantages of any of them.

Methods: We analyzed retrospectively the scores of CHADS2 and CHA(2) DS(2)-VASc in 170 patients with AF and stroke in order to know the correlation between them. The Spearman rank correlation coefficient was calculated for correlation between them. We stratified the risk in both scales in thirds; Upper third CHADS2; considering scores 5-6 points and CHA(2)DS(2)-VASc; 7-9; Middle third in CHADS2; considering scores 3-4 and CHA(2)DS(2)-VASc; 4-6 and lower third in CHADS2 socres; 0-2 and CHA(2)DS(2)-VASc scores 0-3.

Results: 170 patients with mean age 70.5 years were included. There were 102 (60%) women. The main risk factor was hypertension (67%), diabetes (21%), Peripheral vascular disease (19%). Cardiac failure was infrequent (3%). The mean time of follow-up was 39 months (1-297 months). 102 (60%) pts were treated with oral anticoagulants ant the remaining 68 (40%) with aspirin. Stroke recurrence occurred in 31 patients (18%) and seven developed major hemorrhage (4.1%). The distribution of patients in the upper, middle and lower thirds in each scale were in CHADS2; 12%, 75% and 13% respectively, and in CHA(2) DS(2)-VASc; 12%, 76%, 12% respectively (Spearman rank correlations coefficient was $r=.710, P=0.01$).

When analyze the location of scores from those patients with stroke recurrence the distribution were as follow in CHADS2 and CHA(2)DS(2)-VASc; upper third 12% in both scales, middle third 81% and 75% respectively, and lower third 6% and 12% respectively ($p>0.05$).

Conclusion: In our series with patients with stroke and AF there was no any advantage of CHA(2)DS(2)-VASc score over CHADS2.
COGNITIVE DEFICIT AND HIPPOCAMPIC ATROPHY IN A LONG TERM RAT EXPERIMENTAL STROKE MODEL
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Netrin-1 rescues neuron loss by attenuating secondary neuronal apoptosis in ipsilateral thalamic nucleus following focal cerebral infarction in hypertensive rats
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Background
Neurological deficit following cerebral infarction correlates with not only primary injury, but also secondary neuronal apoptosis in loci remote from but connected to the infarction. Netrin-1 is crucial for axonal guidance by interacting with its receptors, deleted in colorectal cancer (DCC) and uncoordinated gene 5H (UNC5H). DCC and UNC5H are also dependent receptors inducing cell apoptosis when unbound by netrin-1. The present study is to investigate the potential role of netrin-1 in neuronal apoptosis in ipsilateral ventroposterior thalamic nucleus (VPN) following focal cerebral infarction in hypertensive rats.

Methods
Renovascular hypertensive Sprague-Dawley rats underwent middle cerebral artery occlusion (MCAO). Continuous intracerebroventricular infusion of netrin-1 (600ng/d for 7 days) or vehicle (IgG/Fc) was given 24 hours after MCAO. Neurological function was evaluated by the postural reflex 8 and 14 days after MCAO. Then, immunoreactivity was determined in ipsilateral VPN for NeuN, glial fibrillary acidic protein, netrin-1 and its receptors (DCC and UNC5H2), apoptosis was detected with TUNEL assay, and the expressions of caspase-3, netrin-1, DCC, and UNC5H2 were quantified by western blot analysis.

Results
MCAO resulted in the impaired postural reflex after 8 and 14 days, with decreased NeuN marked neurons and increased TUNEL positive cells, as well as an up-regulation in the levels of caspase-3 and UNC5H2 protein in ipsilateral VPN, without significant changes in DCC and netrin-1 expression. By exogenous netrin-1 infusion, the number of neurons was increased in ipsilateral VPN, and both TUNEL positive cell number and caspase-3 protein level were reduced, while UNC5H2 expression remained unaffected, simultaneously, the impairment of postural reflex was improved.

Conclusions
Netrin-1 could rescue neuron loss by attenuating the secondary neuronal apoptosis in ipsilateral VPN after focal cerebral infarction, probably via its receptor of UNC5H2.

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Quantification of Reactive Astrogliosis after Experimental Cerebral Infarction
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Background
Reactive astrogliosis after cerebral infarction may be an obstacle to neurite travel and other recovery processes. Restorative therapies may affect, or be affected by, the glial scar, making it an important outcome needing reliable quantification for treatment effects. Several measurement methods have been reported, but direct comparison data are limited. We compared the reliability of commonly reported methods.

Methods
Immunostaining for the astrocyte marker glial fibrillary acidic protein was performed...
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MMP-9, ANTIOXIDANT DEFENSE SYSTEM AND EXTRACELLULAR CYTOKINE HMGB1 AS PREDICTORS OF ACUTE ISCHEMIC STROKE OUTCOME

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Background: The predictors of the outcome of the ischemic stroke (IS) may include clinical features, biochemical parameters and some risk factors. The relations between three main players in the ischemic brain (MMPs, HMGB1 and antioxidants) were estimated in plasma of IS patients.

Methods: The study included 42 patients with acute ischemic stroke within 72 h of onset and 32 suitable controls. Patients were stratified according to GOS (Glasgow Outcome Scale) at 30 days: (1-3) – poor outcome (death and functional decline, (4) – fairly good outcome (moderate disabil-
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Neurorepair potential of CDP-Choline after cerebral ischemia in mice.

Background: CDP-Choline is a well-studied neuroprotective drug with effects reducing infarct volume and neurological deficit in experimental models of stroke and ongoing large clinical trials in the acute stroke setting. However, its effects during stroke recovery are still under investigation.

Methods: Permanent cerebral ischemia was induced by electrocoagulation of the left middle cerebral artery of adult Balb/c mice distally. Regional cerebral blood flow was monitored by laser flowmetry to ensure artery occlusion and infarct extension was evaluated by TTC stain in a separate group (n=7). Treatment animals were assigned randomly to vehicle (n=20) or CDP-Choline (n=20) which received saline or 500 mg/kg of CDP-Choline intraperitoneally starting 24 hours after the ischemic event and daily during one or two weeks. The corner test was performed to evaluate the neurological outcome before, at 4 hours, 24 hours, 7 days or 14 days after the ischemic event. Brain atrophy was quantified as the percentage of reduction of the ipsilateral vs. contralateral hemispheres at 7 days (n=18) or 14 days (n=20) after sacrifice.

Results: Twenty-four hours after cerebral ischemia a large cortical infarct (42.1+/−10.2 mm3) representing the 22.4+/−5.9 % of...
they are ineffective to recanalize occluded arteries, suggesting that occlusive thrombosis involves specific and yet unidentified mechanisms.

Methods: We first characterized an original stroke model in mice, involving high shear thrombosis of the middle cerebral artery. Then, using non-peptidic inhibitors and monoclonal antibodies, we investigated the respective roles of GpIIb/IIIa and GpIbα-von Willebrand Factor (VWF) interactions in occlusive thrombus development by laser Doppler, immunohistological and MRI analyses. Thereafter, we investigated the recanalization efficiency of GpIIb/IIIa and GpIbα-VWF interaction inhibitions, in conjunction or not with tissue-type plasminogen activator (tPA) mediated thrombolysis.

Results: We demonstrated that occlusive thrombus formation is a two-step process: first, platelets aggregate through involvement of their GpIIb/IIIa receptors, resulting in partial occlusion of the blood vessel and in a locally increased shear rate. Subsequently, when the shear stress becomes elevated, platelet aggregation to the developing thrombus becomes GpIbα-VWF dependent, until closure of the vessel lumen. Remarkably, inhibition of GpIbα-VWF interaction by monoclonal antibodies efficiently disaggregated thrombi that were resistant to both tissue-type plasminogen activator (tPA) and GpIIb/IIIa inhibitors.

Conclusion: These results suggest that disruption of GpIbα-VWF interaction represents a promising approach to restore arterial patency in patients with acute ischemic stroke.

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GPIB-ALPHA BLOCKADE RESTORES CEREBRAL ARTERIAL PATENCY AFTER OCCLUSIVE THROMBOSIS.
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Background: Arterial thrombosis is the leading cause of mortality and disability worldwide. Although GpIIb/IIIa inhibitors efficiently prevent thrombus development,
Pulmonary infection by Streptococcus pneumoniae preceding experimental stroke impairs outcome in mice

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Background
Systemic inflammation and infection are key risk factors for stroke and profoundly contribute to outcome. Respiratory infections preceding stroke or occurring after an ischaemic event are associated with impaired survival and recovery. Pulmonary infections by bacteria such as Streptococcus pneumoniae are frequent clinical complications in stroke patients. It has not been tested whether S. pneumoniae infection predisposes to stroke, or impairs outcome in experimental models of focal cerebral ischaemia.

Methods
Male C57BL/6 and ApoE-deficient (−/−) mice fed a chow or an atherogenic diet were infected with three, increasing doses of S. pneumoniae intranasally. In separate chow fed C57BL/6 mice, transient middle cerebral artery occlusion (MCAo) was performed after S. pneumoniae infection. Peripheral and brain inflammation were assessed by histology, immunofluorescence, flow cytometry and cytometric bead array.

Results
Both atherogenic diet and infection induced systemic inflammatory changes, granulocytosis and cerebrovascular inflammation. Spontaneous ischaemic events were not observed. No synergy was observed between diet and infection in ApoE−/− mice, but C57BL/6 mice fed atherogenic diet had increased aortic plaques in response to infection. Infection preceding stroke exacerbated the ischaemic brain injury, brain inflammation and induced proinflammatory cytokines, notably IL-1α and IL-1β in immune organs and the lung.

Conclusion
Our data show that S. pneumoniae infection accelerates cardiovascular pathology, induces cerebrovascular inflammation and results in impaired outcome if infection occurs prior to experimental stroke. These results highlight the role of common pulmonary infections in cerebrovascular disease.
Results: MLC901 up to 3 hours after ischemia improved survival and decreased functional deficits in both models. We demonstrated the critical role of Akt pathway in the MLC901-mediated neuroprotection. MLC901 enhanced neurogenesis and stimulated BDNF expression as well as cell proliferation and neurite outgrowth. MLC901 induced a significant improvement of the motor function assessed by rotarod test. In the water maze MLC901 reduced the increase in escape latency and in swim distance induced by ischemia and increased the time spent in the quadrant of the former platform position during the probe trial.

Conclusion: These preclinical results give a fundamental basis to this Chinese medicine for stroke and cardiac arrest treatment. MLC901 can represent a novel therapeutic strategy after ischemia with a time-window of protection clinically interesting.

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**Hyperoxia and co-administered thrombolysis alter the interrelations between blood-brain barrier permeability and matrix metalloproteinases following embolic stroke in rats**

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Background: Ischemia arising during stroke or cardiac arrest is a major cause of death and disability. Today mild hypothermia and thrombolysis remain the only therapies which can improve outcome of patients. The need for new therapeutic strategies is imperative. Interestingly, NeuroAid (MLC601), a Traditional Chinese Medicine and seems to have beneficial effects in Chinese patients, in post-stroke complications. This work analyzes neuroprotective and neuroregenerative effects of MLC901, a simplified formula MLC601 on brain injury and functional recovery after ischemia.

Methods: Global ischemia (cardiac arrest) was induced by 20 min four-vessel occlusion in rats and focal ischemia (stroke) in mice by 60 min middle cerebral artery occlusion. MLC901 (Moleac) was administered as a post-treatment by intraperitoneal injection (1 microg/mouse, 74 microg/rat) up to 3 hours after ischemia followed by one injection per day for 3, 7 or 21 days after reperfusion. Motor and cognitive performances were tested by using rotarod and Morris water maze tests. After behavioral testing rodents were sacrificed and the neuronal damage was assessed.
Background: Blood-brain barrier (BBB) alterations in focal cerebral ischemia are of interest since underlying mediators, notably matrix metalloproteinases (MMPs) and their inhibitors (TIMPs), were found to participate in tissue plasminogen activator (tPA)-associated BBB opening. This study aimed on interrelations between BBB permeability (BBB-P), MMPs and TIMPs according to different regimes of hyperoxia as potential neuroprotective co-treatment to tPA. Methods: Two hours after embolic middle cerebral artery occlusion, rats were treated with normobaric (NBO) or hyperbaric oxygen (HBO), tPA, tPA+HBO, or received no treatment. BBB-P was assessed by injecting FITC-albumin intravenously at 4 or 24 hours with 1-hour circulation time. MMP-2, MMP-9, TIMP-1 and TIMP-2 serum levels were obtained at 5 or 25 hours. Partial correlations, corrected for time point of measurement, were used to explore interactions of BBB-P in terms of an extravasal FITC-albumin ratio in the lesion-bordering zone and related serum markers. Results: In controls, positive coefficients were found for interrelations between BBB-P, MMP-2 and MMP-9 (r=0.317; r=0.074; n.s.). In contrast, NBO resulted in negative coefficients (r=−0.407 each; n.s.) indicating an inverse association of ischemia-related alterations in BBB-P and MMP levels. For MMP-9, this effect was amplified after HBO alone (r=−0.606; p<0.05). Expectedly, tPA led to positive coefficients for MMP-2 (r=0.161; n.s.) and even more MMP-9 (r=0.495; n.s.), which implies an increased BBB-P concomitantly to tPA-mediated increase in MMP-9. Interestingly, co-administered HBO tended to attenuate this effect, although not quite as strongly as HBO alone. Amongst serum markers, TIMP-1 and -2 were significantly correlated after tPA and HBO, contrary to controls. Conclusions: This study reinforces reports on tPA-mediated increase in MMP-9 and BBB-P. HBO was found to act inversely, but this effect did not sustain when HBO and tPA were co-administered.

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Effects of exogenous BDNF on hypoxic endothelial cells
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Background: Brain-derived neurotrophic factor (BDNF) is found predominantly in brain tissue and acts as a neuronal survival factor. In animal models, BDNF induces synaptic plasticity, promotes cell survival, and triggers endogenous stem cell migration. Here we study the effects of exogenous BDNF on hypoxic endothelial cells. Methods: Microvascular mouse brain endo-
Thrombolytic therapy for acute ischemic stroke in patients with advanced cancer: An evidence-based analysis

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Background: Previous studies have reported that thrombolytic therapy (TT) is associated with improved functional outcomes and reduced mortality in patients with acute ischemic stroke (AIS) and advanced cancer (AC). We performed a systematic review and meta-analysis to evaluate the effectiveness and safety of TT in patients with AC and AIS.

Methods: We performed a systematic review and meta-analysis of all randomized controlled trials (RCTs) and non-randomized studies comparing TT with standard of care in patients with AC and AIS. The primary outcomes were functional independence (Modified Rankin Scale [mRS] 0-2) at 3 months and 6 months and mortality at 3 months and 6 months. The secondary outcomes included stroke severity, quality of life, and safety endpoints.

Results: A total of 15 RCTs and 4 non-randomized studies involving 1,234 patients were included in the analysis. TT was associated with improved functional outcomes at 3 months (relative risk [RR] 1.43, 95% confidence interval [CI] 1.09-1.88) and 6 months (RR 1.44, 95% CI 1.09-1.90) compared to standard of care. The mortality rate at 3 months was similar between the TT and standard of care groups (RR 0.85, 95% CI 0.67-1.08) but was lower at 6 months (RR 0.81, 95% CI 0.67-1.00). No significant differences were observed in stroke severity, quality of life, and safety endpoints.

Conclusion: TT is associated with improved functional outcomes and similar mortality rates in patients with AC and AIS compared to standard of care. Further research is needed to determine the optimal TT protocol and to assess the long-term safety and effectiveness of TT in patients with AC and AIS.
Application of this method to permanent and transient ischemic brain injury models is ongoing.

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**The role of mesenchymal stem cell conditioned medium in recovery after stroke**

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Background: The mechanism of mesenchymal stem cell (MSC) therapy in improving stroke outcome remains unclear. As MSC have not been detected in the brain following intravenous injection, we hypothesized that the beneficial effect may be related to mesenchymal cell secretions. We examined the effects of mesenchymal stem cell culture medium (MSC-CM) in a rodent model of stroke. Particular attention was paid to the role of MSC-CM upon recruitment of endothelial progenitor cells (EPC), which play a central role in vasculogenesis following stroke.

Methods: A thin wire transient middle cerebral artery occlusion (MCAO) of 90 minute duration was performed on 18 adult Wistar rats. MSC (n=6), MSC-CM (n=6) or native medium (n=6) were injected i.v. 4 times during the week following the MCAO. MRI infarct size, rotarod functional recovery, and circulating EPCs were measured. Post mortem immunohistochemistry was performed 4 weeks after MCAO to evaluate the maturation of the vascular network.
Sirtuin 1 (Sirt1; silent information regulator 1) is a member of the sirtuin family of class III histone deacetylases implicated in a wide range of cellular function (Hagis and Sinclair 2010). Many studies have suggested the beneficial effects of Sirt1 in neuroprotection and cardioprotection (Donmez et al., 2010). Citicoline (CDP-choline) is an intermediate in the biosynthesis of phosphatidylcholine that has shown neuroprotective properties in a great variety of CNS diseases including stroke (Hurtado et al., 2008). The aim of this study is to characterize the participation of Sirt1 in the neuroprotective actions of citicoline in experimental stroke in rats.

METHODS

Middle cerebral artery (MCA) was occluded permanently by ligation in rats (MCAO). For infarct size determination, brain was removed and stained with 2% 2,3,5-triphenyltetrazolium chloride. For protein Sirt1 determination, brain tissue was collected from the peri-infarct area of animals after MCAO from rats untreated or treated with citicoline. In addition, rat cultured cortical neurons were prepared (Hurtado et al., 2005) and treated with citicoline (100µM) for 24h.

RESULTS

Focal cerebral ischaemia by MCAO in rats caused a significant increase expression of brain Sirt1 24h after the occlusion as compared with sham-operated animals. Protein levels of Sirt1 were significantly increased in brain of animals treated with citicoline, both in sham and in MCAO-exposed animals, and it was concomitant to a reduction in infarct volume. Citicoline also caused a significant increase in Sirt1 levels in rat cul-
tured cortical neurons. 

CONCLUSIONS

These results strongly support the idea that Sirt1 is involved in the neuroprotection mediated by citicoline, a finding that may prove useful in the treatment not only of stroke but also of other disorders, including neurodegenerative and metabolic conditions.

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CDP-CHOLINE AT HIGH DOSES IS AS EFFECTIVE AS i.v. THROMBOLYSIS IN EXPERIMENTAL ANIMAL STROKE

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Introduction: rt-PA is the only pharmacological treatment currently approved for acute ischaemic stroke. Animal experimental data have demonstrated that CDP-choline administration is effective in protection and brain repair. Promoting protection and brain repair with drugs with trophic action could be as effective on the brain damage reduction as i.v. thrombolysis.

Aims: This study compared the effects of high doses CDP-choline (1000mg/kg) with rt-PA (5mg/Kg) in an experimental animal model of embolic stroke.

Material y methods: Twenty rats completed the experimental protocol: five were sham-operated and the rest embolised in the right internal carotid artery with an autologous clot and divided among 3 groups: 1) control; 2) IV rt-PA 5mg/kg 30 min post-embolisation; 3) CDP-choline 1000mg/kg i.p. ×3 doses, 10 min, 24h and 48h post-embolisation. Functional evaluation scores were evaluated using Rogers test, lesion volume by haematoxylin and eosin staining (H-E), cell death with TUNEL and plasma levels of IL-6 and TNFalpha with ELISA.

Results: In this study CDP-choline and rt-PA produced a significant reduction in brain damage considering infarct volume, cell death and inflammatory cytokines (TN-Falpha and IL-6) compared to the control group. Additionally, CDP-choline significantly decreased infarct volume, cell death and IL-6 levels with respect to the rt-PA group.

Conclusion: High dose CDP-choline is as effective on brain damage reduction as i.v. thrombolysis and it may be an useful treatment for acute ischaemic stroke even in absence of thrombolysis.

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Cerebrolysin reduces β-amyloid deposits and apoptosis in the ipsilateral thalamus and improves the functional recovery following focal cortical infarction


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Background: Abnormal β-amyloid (Aβ) deposits and apoptosis are involved in the
ipsilateral thalamic damage secondary to focal cortical infarction. Cerebrolysin, a peptide mixture derived from porcine brain, has been shown to enhance the functional recovery after stroke. Here we aimed to investigate the protective potentials of Cerebrolysin against the secondary neuronal damage in thalamus and functional recovery after cerebral infarction. Methods: Focal cerebral cortical infarction was induced by distal right middle cerebral artery occlusion (MCAO). Cerebrolysin at a dose of 5 ml/kg was intraperitoneally administered once daily for 7 days, starting at 24 hours after MCAO. Sensory function recovery was assessed using adhesive removal test at 14 days after MCAO. Secondary neuronal damage, Aβ deposits and apoptosis in the ipsilateral thalamus were evaluated with Nissl staining, immunofluorescence analysis and TUNEL staining at 14 days after MCAO respectively. Results: Treatment with Cerebrolysin significantly reduced the mean time to remove the stimulus from left forepaw at 14 days after MCAO compared with saline group (p<0.05). The infarct volume was not significantly different between the Cerebrolysin and saline groups (p>0.05). However, Cerebrolysin markedly increased the number of intact neurons and MAP-2+ cells, and decreased GFAP+ cells in the ipsilateral thalamus at 14 days after MCAO compared with the saline group (all p<0.05). Concomitantly, Aβ deposits and TUNEL+ cells in the ipsilateral thalamus were obviously reduced by Cerebrolysin treatment (both p<0.05). Conclusion: These findings suggest that Cerebrolysin can reduce Aβ deposits and apoptosis in the ipsilateral thalamus, which might be associated with the attenuation of secondary thalamic damage and functional recovery following cerebral infarction.

413 Experimental studies

Comparison of quantitative estimation of intracerebral haemorrhage and infarct volumes after thromboembolism in an embolic stroke model

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Background: Strokes have both ischemic and haemorrhagic components, but most studies of experimental stroke only address the ischemic component. This is likely because investigations of haemorrhagic transformation are hindered by the lack of methods based on unbiased principles for volume estimation.

Methods: We evaluated different methods for estimating the volume of infarcts, haemorrhages, after embolic middle cerebral artery occlusion with or without thrombolysis. An experimental thromboembolytic rat model was used in this study. The rats underwent surgery and were placed in two groups. Group 1 was treated with saline, and group 2 was treated with 20 mg/kg re-
INTERLEUKIN-6 IS ELEVATED IN SEVERE CAROTID STENOSIS

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BACKGROUND: Atherosclerosis is a chronic inflammatory arterial disease that is the main risk factor for frequent vascular events such as stroke and MI. Accurate biomarkers for progression of disease and the risk of plaque embolism are nowadays being researched extensively.

METHODS: Data of a series of 32 patients, 22 male and 10 female. All the patients had undergone a carotid ultrasonography in the Neurology Department of Virgen Macarena University Hospital between the dates May of 2010 and June of 2010. Patients were divided in two groups according to the degree of stenosis (more or less that 70%). Blood levels of several biomarkers (IL-6, IL-8 and TNF-alfa) were measured to assess their validity as indicators of disease activity. The measurements were performed at the Sevilla University R&D Center using a BioPlex® system. Data was analyzed using SPSS 15.0® statistics package.

RESULTS: There was a statistically significant difference in the IL-6 level between the two groups (p<0.011). The differences in IL-8 and TNFα blood levels between groups were not found to be statistically significant.

DISCUSSION: IL-6 levels were found to be increased in the serum of patients with ≥70% carotid stenosis. This finding supports the theory of the crucial role of inflammation in the origin of atherosclerotic disease, as reported in other works.
NADPH oxidase, plasminogen-plasmin system and matrix metalloproteinase overactivities are involved in TNF-alpha-evoked cerebral barrier disruption
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University of Nottingham, Nottingham, UNITED KINGDOM

Background: The pro-inflammatory cytokine TNF-alpha is associated with ischaemic injury-mediated cerebral barrier dysfunction. This study investigates whether NADPH oxidase-mediated oxidative stress, plasminogen-plasmin system (PPS) and/or matrix metalloproteinases (MMPs) are involved in this defect.

Methods: Human brain microvascular endothelial cells (HBMEC) and human astrocytes (HA) were co-cultured to mimic the human blood-brain barrier (BBB) under in vitro conditions before incubating them with/out TNF-alpha (5, 10, 20 ng/ml) for 6 hours. The integrity of the BBB was assessed by measurements of transendothelial electrical resistance (TEER) and sodium fluorescein (NaF) flux across the co-cultures. The mRNA levels of urokinase (uPA), uPA receptor (uPAR), tissue-type plasminogen activator (tPA) and plasminogen activator inhibitor (PAI-1) were measured by RT-PCR. MMP-2 activity was assessed by zymography. NADPH oxidase activity was measured using cytochrome C reduction assay.

Results: TNF-alpha compromised the BBB integrity as evidenced by significant reductions in TEER values and concomitant increases in NaF flux effectively at 5 ng/ml and 10 ng/ml but not 20 ng/ml. In HBMEC, TNF-alpha produced a dramatic increase in total NADPH oxidase activity coupled with a marked increase in gp91-phox mRNA expression, a pivotal NADPH oxidase subunit. Substantial increases were also observed in uPA, uPAR, tPA and PAI-1 mRNA expressions and intracellular and secreted MMP-2 activities in HBMEC treated with 5 ng/ml and 10 ng/ml concentration of TNF-alpha.

Conclusion: These findings suggest that TNF-alpha may perturb the BBB integrity following an ischaemic stroke by increasing the activities of a series of enzymatic systems, namely NADPH oxidase, PPS and MMPs. The existence of a possible cross-talk amongst these enzymes is currently under investigation.
Protein kinase C overactivity augments in vitro cerebral barrier dysfunction through RhoA/ROCK pathway

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Background: Hyperglycaemia (HG) is associated with cerebral barrier dysfunction. This study investigates whether PKC-RhoA/Rho-kinase (ROCK) pathway is involved in this pathology.

Methods: Human brain microvascular endothelial cells (HBMEC) were co-cultured with astrocytes to establish an in vitro model of human blood-brain barrier (BBB) before exposing to normoglycaemia (5.5mM D-glucose) or HG (25mM D-glucose).

Differences in mono-/di-phosphorylated myosin light chain (MLC), RhoA, ROCK, occludin and zonula occludens-1 (ZO-1) protein levels were analysed in HBMEC by in-cell Western analysis. The integrity of the BBB was examined by measurements of transendothelial electrical resistance (TEER) and flux of Evan’s blue-labelled albumin (EBA).

Results: HG increased RhoA, ROCK, mono-/di-phosphorylated MLC protein levels and total PKC activity while dramatically decreasing occludin protein expression. These changes concurred with the actin stress fibre formations, disappearance of ZO-1 and occludin from HBMEC periphery under HG and led to impairments in barrier function characterised by reductions in TEER and an increase in EBA flux. Normalisation of glucose levels, neutralisation of RhoA by anti-RhoA-IgG electroporation and inhibition of ROCK via its specific inhibitor Y-27632 normalised all protein expressions, restored actin and tight junction protein localisation and barrier integrity. Co-treatment of HBMEC with HG and a PKC inhibitor (bisindolylmaleimide-I) ultimately attenuating thrombin generation.

APC is generated when thrombin binds to thrombomodulin (TM) and protein C binds to endothelial protein C receptor (EPCR) on endothelial cells. Both of these receptors have a soluble form.

Methods: 82 people were recruited within 3 days of having an ischemic stroke. Mortality data were collected for 2 years. Blood samples were collected in citrate containing sodium benzamidine for measurement of APC antigen levels by ELISA, and in citrate for measurement of soluble (s) TM and soluble EPCR by ELISA.

Results: Both sTM and sEPCR were negatively correlated with plasma APC concentrations (R=-0.249, p=0.026; R=-0.219, p=0.051 respectively). There was also good correlation between soluble thrombomodulin and sEPCR (R=0.323, p=0.002). There was no association between APC and F1+2 levels (marker of thrombin generation).

Conclusion: Our results suggest that, as sTM and sEPCR shedding increases, cell surface expression of these receptors decreases, resulting in a diminished ability to generate the anticoagulant APC. The lack of association of APC with thrombin generation may suggest that other properties (e.g. anti-inflammatory and neuro-protective) of APC may be important in acute stroke.
normalised the ROCK and mono-/di-phosphorylated MLC levels. Moreover, specific inhibitors of PKC-alpha (Ro-320432), PKC-beta (LY333531), PKC-beta-II (CGP33352) attenuated PKC overactivity. In addition, co-exposure of HBMEC to HG and Ro-320432, LY333531 or CGP33352 improved barrier integrity, normalised all protein expressions and restored actin localisation.

Conclusion: The PKC overactivity, appears to modulate cerebral barrier function through regulation of RhoA/ROCK pathway and cytoskeletal formation.

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Quantitative Electrical Correlates of cerebral vasodilatory reserve in symptomatic carotid or middle cerebral artery steno-occlusive disease
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Background- Intracranial stenosis is associated with high-risk of stroke recurrence. In severe stenosis, perfusion is maintained by cerebral autoregulation (CA). CA may be impaired due to inadequate cerebral vasodilatory reserve (CVR). However, the methods of assessing CVR with transcranial Doppler (TCD) and acetazolamide-challenged HMPAO-SPECT may not be reliable in some patients. While TCD fails in patients with insufficient temporal acoustic windows, SPECT imaging may not be reliable in patients with bilateral severe steno-occlusive disease. Quantitative electroencephalography (QEEG) monitors electrical brain activity with excellent spatial and temporal resolution. We aimed to assess the utility of QEEG in assessing CVR in patients with severe stenosis of carotid (ICA) or middle cerebral arteries (MCA).

Methods: Symptomatic patients with severe steno-occlusive disease of ICA or MCA were evaluated for CVR with TCD monitoring during voluntary breath-holding. Breath holding index (BHI) of <0.69 was considered to represent impaired CVR. Continuous EEG was performed simultaneously with TCD and quantitative analysis was performed. Patients with impaired CVR were further evaluated with acetazolamide-challenged HMPAO-SPECT.

Results- 21 patients (16 males, mean age 67yrs) with severe intracranial steno-occlusive disease and impaired CVR on TCD were included. 3 patients suffered from bilateral severe disease. 7/21 patients, with BHI<0.3, were found to have significantly impaired perfusion and CVR on SPECT imaging. All 7 patients showed significant abnormalities on QEEG. Of the 3 patients with bilateral severe stenosis, 2 had BHI<0.3 in bilateral MCAs but, only 1 demonstrated abnormality on SPECT. QEEG demonstrated abnormal results in both the patients.

Conclusion- Impaired CVR might influence cerebral electrical activity and the dynamic changes can be observed reliably with QEEG. Our preliminary pilot data supports this hypothesis. QEEG might help in evaluating CVR even in patients with insufficient temporal acoustic windows or bilat-
Effects of PDE5 inhibitors on TNF-alfa mediated change in human brain microvascular endothelial cell cultures.

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Background: Cerebral ischemia initiates an inflammatory response, in part mediated by endothelial cells, causing increase in TNF-alfa leading to tissue damage. In rat models of stroke inhibitors of the cGMP specific phosphodiesterase 5 (PDE5) such as sildenafil and tadalafil, improve functional outcome post stroke. In humans the less selective PDE5 inhibitor, dipyridamole, is used for secondary prevention of stroke. We hypothesized that such effects of PDE5 inhibitors involve changes in endothelial adhesion molecules. The PDE5 inhibitor effects on cytokine mediated changes in vascular cell adhesion molecule 1 (VCAM-1) and VE-cadherin protein expression was investigated in primary human brain microvascular endothelial cells (pHBMECs).

Methods: pHBMEC (Cell Science, 3H Biomedical) were grown to passage 5 and 6 in 6-well plates to obtain a density of 350000 cells/well, starved overnight and pre-incubated for 20 minutes with sildenafil (1 µM), tadalafil (1 µM), dipyridamole (0.9 mM) or DMSO (control), after which the cells cultures were added 10 ng/ml TNF-α for 10 minutes. The cells were harvested at 4, 8 and 24 hours. Changes in protein expression of VE-Cadherin and VCAM-1 were analysed using semi-quantitative Western blot. Results: No significant changes in VE-cadherin protein expression after PDE5 inhibitor treatment were detected. TNF-alfa induced VCAM-1 protein expression was significantly (p < 0.05) attenuated by tadalafil and dipyridamole, but not sildenafil, at 24 hours post TNF-α stimulation. Conclusion: In conclusion, PDE5 inhibitors show differential effects on TNF-alfa induced change in VCAM-1 but not VE-cadherin protein expression. The effects of PDE5 inhibitors on stroke recovery may involve changes in endothelial adhesion molecules, though the mechanisms behind needs further study.

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Effects of PDE5 inhibitors on TNF-alfa mediated change in human brain microvascular endothelial cell cultures.

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1. European Stroke Conference

Scientific Programme

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**Chlamydia pneumoniae infection drives important molecular mechanisms in human endothelial cells leading to proatherosclerotic phenotype.**

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Background: Our previous studies in carotid arteries demonstrated that infection with Chlamydia pneumoniae (Cpn) is common in early lesions. Therefore, Cpn may play an important role in the activation and development of the initial stages of carotid atherosclerosis. The purpose of the present study was to study molecular mechanisms in human carotid artery endothelial cells during Cpn infection.

Methods: A genome-wide expression profile was performed at 2h, 24h and 72h post-infection (pi). Feature Extraction Software was used to process array images. FatiGO and Ingenuity Pathway Analysis were used to perform a time-course study and to analyze biological mechanisms and functions of the genes. Expression of selected genes was confirmed by quantitative-PCR.

Results: 951 genes displaying different expression patterns in at least one of the time-points of infection were identified using a Fold Change superior than 1.2 and a adjusted p-value lower than 0.05. Inflammatory genes such as cytokines, chemokines, adhesion molecules, transcription factors and pro-angiogenic genes were overexpressed 2h pi. However, processing and antigen presentation pathways were activated 72h pi. Genes related with the interferon family were overexpressed 72h pi. An anti-apoptotic phenotype was present at 2h pi leading to a pro-apoptotic stage at 24h and 72h pi.

Conclusions: Inflammation, immune responses and apoptosis are activated upon Chlamydia pneumonia infection in endothelial cells. The genomic responses identified in this study provide valuable information opening new investigation pathways related with early carotid atherosclerosis.

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**Blood-brain barrier breakdown after ischaemic stroke: the role of oxidative stress, plasminogen activators and matrix metalloproteinases.**

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Background: An increase in oxidative stress, through enzymes such as NADPH oxidase, is a key mechanism of ischaemic reperfusion injury. The superoxide anion (O2.-) produced may regulate plasminogen activators (PAs) such as urokinase (uPA) and therefore downstream metalloproteinase (MMP) activity, resulting in disruption
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Assessment of blood flow and 3D microstructure of atherosclerotic carotid plaque using confocal microscopy

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Background

Although stroke is generally understood as a medical phenomenon, it is also a physical event deeply rooted in fluid dynamics. Little is known about the mechanical forces that might interact with the patho-biology of carotid plaque, reinforcing the need for better understanding of the stroke processes in a mechanical context. This study aimed to (i) investigate whether confocal microscopy can be used to obtain 3D visualisation of the micro-structure of atherosclerotic plaque.
Carotid plaques; (ii) construct a blood flow model with a view to investigate how forces resulting from fluid flow interact with structural stability of carotid atherosclerotic plaque and how such interactions may impact on stroke prevention.

Methods

Carotid plaque specimens were collected from routine endarterectomy surgical operations. Both bright-field microscopy and Laser Scanning Confocal Microscopy (LSCM) were used to generate 3D image datasets and visualisations of surgically removed carotid plaques.

In order to simulate the effects of plaque in the artery, simple flow models were created using COMSOL v3.2 (COMSOL AB). The models simulated reduction in lumen diameter as well as a small process emanating from one wall. The simulation used the Incompressible Navier Stokes equation in 2D.

Results

Evidence of carotid plaque vulnerability was demonstrated by reduced fibrous cap thickness and large lipid-necrotic core with evidence of cracking (Fig-1). A blood flow simulation model (Fig-2) shows how blood velocity changes could occur associated with reduction in lumen diameter caused by the plaque. The degree of carotid artery stenosis measurements obtained from these flow models were consistent with and comparable to the degree of stenosis measurement recorded on the pre-operative vascular ultrasound reports of patients from whom these plaques were originally taken.

Conclusion

These techniques could help assessment of factors affecting plaque morphology and identify mechanical forces involved in plaque vulnerability and disruption. The generation of 3D images should allow comparison of 3D microstructure with clinical imaging assessment and blood flow investigations.
Potential Neurovascular Oxidative Stress Through Nitric Oxide and soluble Lectin-like Oxidized Low-Density Lipoprotein Receptor 1 (sLOX-1) in Acute Ischemic Stroke: A pilot study.
S. Muengtaweepongsa, K. Srikwan, K. Suwanprasert
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Background: Experiment stroke studies indicate that neurovascular oxidative stress is a major contributing factor to cerebral injury. Accumulating evidence suggests that LOX-1 plays a crucial role in atherosclerosis and can be cleaved from the cell surface and releases as sLOX-1. Elevated sLOX-1 level may be indicative of plaque instability. Serum sLOX-1 level is elevated in Acute Coronary Syndrome and may appear to be a useful marker for early diagnosis of coronary plaque rupture. Plasma Nitric Oxide is lower in patients with acute thrombotic stroke. Objectives: We investigated changes of plasma nitric oxide (NO) and sLOX-1 levels during 72 hrs after onset of acute ischemic stroke. Methods: Changes of plasma NO and sLOX-1 were studied within the first 72 hrs after onset in 65 acute ischemic stroke patients (age 62.5±14.4 yrs) and compared with those of basal levels in 18 control subjects with no underlying disease. Plasma NO concentration was measured by electrochemistry technique while sLOX-1 was assessed by ELIZA. Results: During first 72 hrs after onset, plasma nitric oxide levels were reduced and sLOX-1 levels were elevated, in all patients with acute ischemic stroke as compared with those of control. Remarkably reduced plasma nitric oxide levels were showed in patients with symptomatic carotid stenosis. Higher sLOX-1 levels were appeared in both symptomatic carotid stenosis and non-carotid stenosis groups. Also, sLOX-1 levels were significantly elevated in patients with symptomatic carotid stenosis. However, sLOX-1 levels were dropped quickly when approaching Day 3 in non-carotid stenosis group which declined almost as same as at basal levels. In contrast, plasma nitric oxide levels were dramatically increased at the same period of time. Notably, a minimal elevation of sLOX-1 levels with slight reduction of plasma NO levels were apparent in lacunar infarction group.

Conclusion: sLOX-1 was extremely influenced by large arterial stenosis and may be potential neurovascular oxidative stress associated with NO. Further study is needed to clarify these findings.
Vascular biology

vascular endothelial dysfunction in cerebral leukoaraiosis
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Background: The chronic subclinical ischemia has been considered as one of major causes of leukoaraiosis. It is unknown what trigger the chronic ischemia. Vascular endothelium has a major role in maintaining a cerebral perfusion through autoregulation. This study evaluate the endothelial NO bioavailability in patients with leukoaraiosis.

Methods: We enrolled consecutive patients with lacunar syndrome or transient ischemic attack. Control group was age and sex matched patients with hypertension without any neurological abnormality. All participants had a flow mediate dilatation of brachial artery (FMD) to evaluate the endothelial function. Leukoaraiosis was defined as ill defined patch high signal intensity lesion on FLAIR and low signal intensity lesion on T1WI. Ischemic leukoaraiosis was defined as patients with leukoaraiosis and lacunar infarction. Leukoaraiosis only did not have any lesion except for leukoaraiosis on brain MRI.

Results: A total of 75 (leukoaraiosis 37, control 38) were enrolled in this study. Demographic and clinical characteristics were similar between two groups. FMD was low in patients with leukoaraiosis compared to control (p<0.05). FMD was lower in patient with leukoaraiosis only and ischemic leukoaraiosis than that of control (p<0.05), but FMD was not differ significantly between patients with leukoaraiosis only and ischemic leukoaraiosis (p>0.05).

Conclusions: NO bioavailability of vascular endothelium is decreased in patients with leukoaraiosis only and ischemic leukoaraiosis compared to control. These results may be suggestive of a possible causative role of endothelial dysfunction in the pathomechanism of leukoaraiosis.

Meta-analysis and reviews

Reliability of the Barthel Index in stroke
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Introduction
The Barthel Index (BI) is a ten item, ordinal measure of activities of daily living. It is commonly used in stroke, both in clinical practice and as a trial outcome measure. Certain stroke outcome measures are limited by poor reliability. We sought to describe the inter-observer variability of BI in stroke cohorts using systematic review and meta-analysis.

Methods
We created a sensitive search strategy, in-
formed by an information scientist, with multiple search terms describing concepts relating to “disability assessment”; “reliability” and “stroke”. Two assessors independently searched various multidisciplinary electronic databases, including databases specific to test accuracy from inception to April 2011. We hand searched journals specific to stroke and contacted authors. Bibliographies of manuscripts were screened and the process repeated until no new data were found. Manuscripts were reviewed against pre-specified inclusion criteria. We quality assessed included studies using a bespoke tool. Primary outcome of interest was reliability, measured by weighted kappa ($\kappa_w$). We performed meta-analysis of extracted data (random effects model) using Comprehensive Meta-analysis software.

**Results**

Of 15714 screened titles; we reviewed 34 manuscripts and included 11 papers (n=623 subjects) for final analysis. There was heterogeneity amongst the studies. Many items in our quality assessment tool were poorly reported in the included studies. Where data allowed we performed meta-analysis (8 papers). Overall reliability of BI was excellent $\kappa_w$:0.95 (95% confidence interval 0.945-0.956).

**Conclusions**

Published reports of BI properties suggest excellent reliability, based on this BI seems an appropriate outcome measure for trials. However included studies were modest in size, with clinical heterogeneity and variable methodological quality. A large scale study of BI properties, designed to mimic a contemporary, multi-centre clinical trial seems appropriate.

**426 Meta-analysis and reviews**

**Evaluation of Subject Matching Methods to Adjust for Imbalances in Stroke Trials**

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Baylor College of Medicine and Michael E. DeBakey VA Medical Center, Houston, USA¹, Baylor College of Medicine, Houston, USA², University of Cincinnati, Cincinnati, USA³, Baylor College of Medicine and Michael E. DeBakey VA Medical Center⁴

**BACKGROUND:** Imbalances in baseline factors that affect outcome are common and have added uncertainty to the validity of outcomes in stroke trials. We reported a weighted-Euclidean matching method (pPAIRS©) to correct for imbalances in the NINDS rt-PA trial and demonstrated its ability to generate matched samples [Mandava et al, Stroke, 2010]. Here we compare pPAIRS© to the often recommended Propensity Score. Propensity Score is most valid with large populations with overlapping Gaussian distributions rarely found in stroke trials.

**METHODS:** The NINDS database was used. Subjects were matched based on NIHSS, age and baseline glucose. pPAIRS© matching is based on the equation:

$$\sqrt{((wt_\text{NIHSS1}-\text{NIHSS2})^2+(wt_\text{a}(\text{Age1}-\text{Age2}))^2+(wt_\text{g}(\text{Glucose1}-\text{Glucose2}))^2)}$$

Multiplication by weight mitigates the influence of glucose and age which range
over larger values than NIHSS. Extreme outliers were eliminated based on interquartile ranges by a formula suggested by Tukey. Propensity Score is the probability that a subject was assigned to a specific arm and is obtained by regression performed on independent variables after assigning a 1 to a dependant variable if a subject was in the rt-PA arm, a 0 otherwise. The distance in space between matched pairs, or City-block distance (CBD) was the measure of effectiveness of finding a good match. RESULTS: Euclidean matching and outlier elimination resulted in 283 pairs with CBD ranging from 0.06-72.35 (Mean +/- SD: 17.7 +/- 12.45). Propensity Score produced 259 pairs with CBD ranging from 4.20-449.15 (80.6 +/- 76.41); p < 0.01 by ANOVA.

CONCLUSION: Weighted Euclidean matching yielded the best matched pairs. Propensity Score was hampered by a narrow range of possible propensity scores (0.3-0.6) along with non-Gaussian and non-overlapping distributions of independent variables, both common features of stroke trials in which the distribution of baseline variables is unpredictable unless the number of subjects is prohibitively large.

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Platelet activation, function and reactivity in atherosclerotic carotid artery stenosis: A systematic review of the literature

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Introduction: An important proportion of TIA’s or ischaemic strokes are attributable to moderate or severe (50 – 99%) atherosclerotic carotid stenosis or occlusion. Platelet biomarkers have the potential to improve our understanding of the pathogenesis of vascular events in this patient population.

Methods: A detailed systematic review of the literature was performed to collate all available data on ex vivo platelet activation and platelet function/reactivity in patients with carotid stenosis.

Results: Two hundred and thirteen potentially relevant articles were initially identified; 26 manuscripts met criteria for inclusion in this systematic review. There was no consistent evidence of clinically informative data from urinary or soluble blood markers of platelet activation in patients with symptomatic moderate or severe carotid stenosis who might be considered suitable for carotid intervention. Data from flow cytometry studies revealed evidence of excessive platelet activation in patients in
the early, subacute or late phases after TIA or stroke in association with moderate or severe carotid stenosis (5 studies, p<0.05), and in asymptomatic moderate or severe carotid stenosis compared with controls (2 studies, p<0.01). Furthermore, pilot data from 3 studies (p<0.05) suggest that platelet activation may be increased in recently symptomatic than in asymptomatic severe carotid stenosis. Discussion: Excessive platelet activation and platelet hyper-reactivity may play a role in the pathogenesis of first or subsequent TIA or stroke in patients with moderate or severe carotid stenosis. Larger longitudinal studies assessing platelet activation status with flow cytometry, and platelet function/reactivity in symptomatic versus asymptomatic carotid stenosis are warranted to improve our understanding of the mechanisms responsible for TIA or stroke.

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**Neurothrombectomy in acute ischemic stroke: does mechanical recanalization fulfill a good clinical outcome prediction?**

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**Background**

Over the past decade, clinical research was mainly focused on the early arterial revascularization, leading to the development of a large number of mechanical thrombectomy devices achieving an important recanalization rate in acute ischemic stroke. When and which mechanical device should be applied, separately or in a combined approach with intravenous and intra-arterial thrombolysis is not known.

**Methods**

We analyzed published data of 14 prospective observational studies (722 patients) having evaluated the most commonly used neurothrombectomy devices: Merci retrieval, Penumbra system and Solitaire stent. A multivariate log-regression was performed on recanalization rate (TICI 2b-3), functional independence (mRs</=2 at 3 months) and symptomatic intracranial hemorrhages (ICH) rates data.

**Results**

The recanalization rate was ranged from 43 to 100% (mean value - 77 ± 5%) and the good clinical outcome was achieved in 37 ± 3%, the symptomatic ICH rate and mortality were 5.5% ± 1.1 and 28.3 ± 3.5%, respectively. The functional independence was significantly correlated with the recanalization rate (R²=0.71, p<0.001) and inversely correlated with the baseline NIHSS, but it wasn’t influenced by the mean age. We didn’t found any statistically significant device-specific difference in mortality, symptomatic ICH rates and baseline characteristics.

The recanalization rate is a powerful predicting factor of good clinical outcome and new-generation devices can open up to 100% of occluded brain arteries. Nevertheless, the successful recanalization wasn’t always followed by the clinical outcome expected improvement.

**Conclusion**

The additional selection criteria, with an implication of mismatch concept, and col-
laterals flow imaging may be needed for acute stroke mechanical reperfusion therapy evaluation in randomized trials, in order to refine triage and minimize adverse effects.

Background: A recent systematic review and meta-analysis estimates that the prevalence of depression in people who provide informal care to stroke survivors is 28% (95% Confidence interval 23%, 33%). However, depression has a multifactorial aetiology. Known risk factors and correlates include female gender, younger age, lifetime history of mental health problems, lower socio-economic status and familial transmission. The objective of this systematic review and meta-analysis was to assess whether existing studies provide scientific evidence of an association between exposure to providing informal care and depression.

Methods: The following electronic databases were searched: MEDLINE, EMBASE, CINAHL and ten other databases. Conference proceedings and trials registers were searched, reference lists of relevant articles were scanned and researchers and authors in the field were contacted. Studies were included if the focus was on: study carers of stroke survivors living in the community,
had no restrictions on admissible participants, had no restrictions on type of stroke patient, and depression measured using standard criteria. Types of epidemiologic study eligible included: cohort studies, case-control studies, including prevalent case-control studies and cross sectional studies. All studies required to have appropriate controls. Studies using a randomised controlled trial were excluded because they generally including a selected group. Two review authors selected studies for inclusion, independently extracted data and assessed methodological quality.

Results: We found no cohort studies that met our inclusion criteria. No cross sectional studies identified included, as participants, all persons in the population at time of ascertainment or a probability sample of all such persons, selected without regard to informal care exposure status or depression status. We found no case control studies. Conclusions: There is insufficient evidence to support or refute an association between exposure to providing informal care and depression. Therefore, at present there are no obvious implications for intervention.

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Main causes and long term prognosis in patients presenting with TIA and diagnosed as non-vascular (TIA mimics)

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Background: Patients with TIA have a high risk of early recurrent stroke, and urgent diagnosis and treatment are required. However, up to 50% of patients seen at TIA clinics have a non-vascular (TIA mimics) diagnosis but little is known of their prognosis. We aimed to determine the main causes and long term prognosis of patients with TIA mimics.

Methods: We searched MEDLINE, EMBASE and other relevant sources from 1980 to present for all published studies assessing main causes and long term outcomes of patients presenting as TIA but diagnosed as TIA mimic (including atypical TIA, TIA mimics, transient neurological attack or non cerebrovascular). We included studies reporting risk of stroke, cardiovascular (CV) events, death and other neurological events in TIA, TIA mimic and (if available) non-neurological controls.

Results: 16 studies were identified for frequency and causes of TIA mimics. Rates ranged from 9 to 59% (mean 36%); main causes included migraine (26%), vertigo (15%), syncope (9%) and epilepsy (5%). We identified 7 studies of 2966 participants with data for prognosis: 6 were prospective, 1 retrospective. 55% of data came from 1 prospective study. Follow-up was at least 1 year in all but 1 study. The rate of stroke and CV events was lower in mimics than real TIA. However, TIA mimic patients had higher rates of stroke (HR 1.56), CV events (HR 1.86) and dementia (HR 1.59) than controls. In 2 studies, the risk of CV events increased with the presence of CV risk factors in TIA mimic patients vs. controls and 1 study reported higher risks of major cardiac events in patients with TIA mimics than in patients with TIA.

Conclusion: Patients diagnosed as TIA...
mimic have lower risks of stroke than those with TIA but higher risk of stroke and CV events than asymptomatic controls and CV risk factors appear to increase this risk. TIA mimic is not a benign diagnosis.

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Treatment of Extracranial Carotid Artery Aneurysms

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Background
Aneurysms of the extracranial carotid artery (ECAA) are relatively rare. No clear treatment indications for ECAA exist today. Furthermore, despite several treatment options being developed over the last 20 years, treatment outcome is still largely unknown. The objective of this study was to systematically review all available published data regarding treatment outcome for patients undergoing ECAA treatment.

Methods
We identified all reports on ECAA treatment in PubMed and Embase from 1900 through August 2011 using synonyms for “carotid artery”, “aneurysm” and “therapy”. We extracted data of individual patients including patient characteristics, aneurysm parameters, etiology, method of intervention, and major events (death or stroke) during follow-up.

Results
We identified 238 articles comprising individual data of 451 patients (290 male (64.3%), mean age 52 years). ECAA mean diameter was 33mm, were in 60.3% located in the internal carotid artery and were most often of traumatic origin (19.7%). Treatment consisted of a conservative treatment in 49 (10.9%), surgery in 307 (68.1%), endovascular approach in 86 (19.1%), and a hybrid approach in 8 (1.8%) patients (Table 1).

Data on outcome in the early postoperative phase were available on all patients revealing 29 major events (6.4%). The highest major event rates were found in patients presenting with a ruptured ECAA (Table 1).

Follow-up was available for 253 patients (56%), with a mean of 34.5 months. During the follow-up period 28 major events (11.1%) occurred.

Conclusion
In this systematic review on individual data, treatment of ECAA mainly consists of surgery. Stroke or death following treatment are considerable in short and long term follow-up in ECAA patients. However, the available evidence is limited due to the relatively small number of reported cases in international literature.
emic preconditioning (IPC) can reduce cerebral infarct size in experimental models. We hypothesized that transient ischemic attack (TIA) can afford IPC-like protection against stroke in humans.

Methods. We searched MEDLINE and Russian databases for trials that addressed the effect of preceding TIA on stroke outcome and mortality. We identified additional studies by searching through the bibliographies of eligible studies as well as the archives of neurological conferences and meetings. Statistical analyses were performed with Mantel-Hanzel test.

Results. In total, sixteen relevant trials were identified. Six studies with 8615 patients, who fulfilled all of the inclusion criteria, were considered for the final analysis. There were 7912 patients with stroke only and 703 patients with TIA before stroke within the cohort. The patients with a history of TIA prior to stroke had more favorable clinical outcome when compared to the patients with stroke (p=0.0002). To test the effect of TIA on stroke mortality two trials were analyzed, including 3108 patients with stroke and 361 patients with TIA before stroke. TIA had no effect on mortality after stroke (p=0.30). All patients included in this analysis were older than 60 years, which might, at least partly, account for lack of positive result. The effects of TIA on neurological deficit, occurrence of disability, and cerebral infarct size were not analyzed because of the significant differences in the approaches used in the studies under scrutiny.

Conclusions. Presence of TIA prior to stroke can precondition human brain, as evidenced from the better clinical outcomes.

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Transient ischemic attack preconditions brain against stroke in humans: a meta-analysis

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Background. It is generally held that ischemic preconditioning (IPC) can reduce cerebral infarct size in experimental models. We hypothesized that transient ischemic attack (TIA) can afford IPC-like protection against stroke in humans.
in the patients who had a history of TIA before stroke.

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Systematic review of stroke diagnosis and management by neurologists compared to non-neurologists
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Background: Efforts to improve stroke care have an increasing evidence base. Although most stroke care in the USA and Europe is provided by neurologists, there is a need to provide itemized evidence of stroke care by neurologists beyond the evidence base for stroke units. This review sought to measure new stroke diagnostic yield from in-hospital referrals to neurologists and compare stroke investigations, lengths of stay and outcomes in acute stroke patients managed by neurologists and non-neurologists.

Methods: PubMed and OVID searches were made to search for specialty-physician comparisons in stroke diagnosis, investigation rate, length of stay and clinical outcomes.

Results: Six studies fulfilled inclusion criteria for either the diagnostic or management component of the systematic review. Diagnostic data were available from two studies in which neurologists provided a new stroke diagnosis in 15 of 76 patients (20%). In three observational studies neurologists requested more investigations than non-neurologists. Itemized quality of care measures in one 2010 study, however had little evidence of a physician specialty effect. Length of stay was shorter in one intracerebral hemorrhage study (n=129) for neurologists/neurosurgeons compared to other physicians. Improved outcome was demonstrated in two studies but selection bias may have played a role in this finding.

Conclusion: Neurologists appear to provide more stroke diagnoses and more investigations among acute stroke patients than non-neurologists. Although further studies of stroke outcome and physician specialty correcting for casemix and stroke unit facilities may be helpful, current evidence suggests that acute stroke patients should be managed by neurologists.

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Dementia and thrombolysis: systematic review.
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Background: approximately 10% of first-ever stroke patients were demented before stroke, half of them only being diagnosed. Because of amyloid angiopathy, lipohyalinosis and lower capacity to recover from brain injury, demented patients treated with rt-PA for ischaemic stroke might have an increased risk for symptomatic intracerebral haemorrhage (sICH) and worse outcomes. Our objective is to evaluate the influence of dementia before stroke on the risk of sICH and outcome at 3 months in patients treated with rt-PA for ischaemic stroke. Methods:
We systematically reviewed the literature about the relationship between cognitive decline before stroke and outcome at 3 months in the ischaemic stroke patients treated with rt-PA published from 1966 to 28th October 2011. We included the studies which (i) were conducted in adults; (ii) systematically evaluated cognitive impairment before stroke; (iii) evaluated outcome at 3 months with sICH, modified Rankin scale and mortality. Results: Only one study evaluated the safety of rt-PA according to the pre-existing cognitive state but not functional outcome. This study showed that patients with dementia had neither statistical difference in sICH (5.80% vs. 4.51%, p=0.45) nor in early mortality (17.39% vs. 14.49%, p=0.31) compared with non demented patients. Conclusion: The strengths of this review are the systematic approach and the importance of the research question in clinical practice. Limitations are (i) the lack of randomised data; (ii) all available data come from single study; (iii) the lack of information of the baseline neurological severity, onset-to-needle time, systematic evaluation of pre-existing cognitive decline without dementia and the dependency at 3 months. The on-going French-Japanese OPHELIE-COG study is currently addressing this question.

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Ozagrel for acute ischemic stroke: a meta-analysis of data from randomized controlled trials

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Background: In patients with acute ischemic stroke (AIS), platelets are activated in the acute phase, releasing neurotoxic and thrombogenic eicosanoids, that might reduce the brain blood flow and cause brain damage. Sodium ozagrel (ozagrel), a thromboxane A2 (TXA2) synthase inhibitor, is one of the most studied drugs which could reduce the risk of early recurrent ischemic stroke and reduce the volume of brain damage. We systematically reviewed all published randomized controlled trials comparing ozagrel with control among patients with acute ischemic stroke.

Methods: We searched 7 databases, using the Cochrane Stroke Group search strategy and terms of ozagrel and stroke. Two independent investigators evaluated trial quality using the Cochrane Collaboration’s risk of bias tool and extracted the data of each study. Pooled analyses for the outcomes of combined death or disability and improvement of neurological impairment were calculated.

Results: The effect of ozagrel on the reduction of death for AIS at the end of treatment was RR=0.54 (95%CI, 0.15 to 1.94) (Figure 1). The effect evaluated by Modified Edinburgh-Scandinavian Stroke Scale (MESSS) at end of treatment is Mean Difference (MD)=−4.17 (95%CI, -4.95 to -3.40) (Figure 2). The most severe adverse events of ozagrel were digestive hemorrhage and hemorrhagic stroke, however, there was no significant difference between the two groups. The subgroup analysis of different dose shows that 80mg and 160mg ozagrel per day can both increase the im-
The effect of ozagrel on the reduction of death for AIS at the end of treatment

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**Background:** With the advent of newer rehabilitative techniques and novel regenerative therapies for stroke, identifying patient groups that might benefit most from interventions at different times is of increasing importance. The nervous system hierarchy from task planning to execution is understood to certain extent. Neuro-imaging correlates of the natural history of post-stroke function recovery may aid case selection or offer biomarkers of treatment response.

**Methods:** We performed a systematic review of Ovid Medline and EMBASE databases for published articles between inception & April 2011 that reported on neuro-imaging (functional MRI, Diffusion Tensor Imaging, Positron Emission Tomography & Magnetic Resonance Spectroscopy) correlates of function recovery.

**Results:** Of 9152 articles retrieved, 142 met criteria. Ninety one fMRI articles were included of which 52 were motor recovery studies (20 Aphasia, 3 Neglect, 5 Visual, 2 Cerebellar, 4 Gait & 3 Sensory/proprioception). Twenty seven articles evaluated DTI parameters (26 motor, 1 visual). Twenty one evaluated PET parameters (13 motor, 5 aphasia, 2 neglect & 1 post stem cell implantation) & 3 evaluated MRS parameters. Among 52 fMRI motor studies, 454 patients (mean age 57yrs) were studied of which 80% comprised sub-cortical-only strokes & 88% infarcts. Mean time from stroke onset to first scan was 281.25 days with a wide range from 1 to 2880 days. Longitudinal fMRI study designs comprising 80 patients were reported in 12 studies. Healthy volunteers as controls (mean age 45 years) were included in 22 studies. The effect evaluated by Modified Edinburgh-Scandinavian Stroke Scale (MESS) at end of treatment

**Neuro-Imaging Correlates of Function Recovery after Stroke: A systematic review.**

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**Neuro-Imaging Correlates of Function Recovery after Stroke: A systematic review.**

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Background and purpose: International guidelines recommend cognitive and mood assessments for stroke survivors, these assessments also have utility in clinical trials. There is no consensus on which tools to use. We aimed to describe the use of cognitive and mood measures in contemporary stroke trials.

Methods: Two independent, blinded assessors reviewed high impact journals representing: general medicine (n=4), gerontology (n=2); neurology (n=3); psychiatry/psychology (n=4) and stroke (n=3) January 2000 to October 2011 inclusive. Journals were hand searched for relevant, original research papers that used cognitive/mood assessment in human stroke survivors. Data were checked for relevance by an independent clinician and clinical psychologist.

Results: Across 8,112 stroke studies, 406 (5%) included a cognitive or mood measure. Of these papers, total number with cognitive assessment was 331 (82%); total number with mood assessment tools was 212 (52%). Total number of different assessments used was 344 (cognitive:278; mood:66). The most commonly used cognitive measure was Folstein’s Mini-Mental State Examination (n=149 papers,37% of all papers with cognitive/mood outcomes); the most commonly used mood assessment was Short Form-36 (n=40,10%).

Conclusion: Cognitive and mood assessments are infrequently used in stroke research. When employed, there is substantial heterogeneity and certain prevalent assessment tools may not be suited to stroke cohorts. Research and guidance on the optimal cognitive and mood assessment strategies for clinical practice and trials is required.
Stroke is a severe complication after rheumatic heart disease (RHD), but data about its incidence and case-fatality in RHD patients’ population is unclear. We performed a systematic review of published studies to understand the incidence and case-fatality of stroke in patients with RHD around the world.

Methods
We searched Ovid Medline, EMBASE, CBM, CNKI and VIP for observational studies reporting the association of stroke and RHD until April 2011 published in English or Chinese. Manual searches of bibliographies were supplemented. Two authors independently assessed the compliance of studies with eligibility criteria in a two step approach and then made a final decision. We calculated incidence of stroke per RHD patient-year, if possible. We did not conduct meta-analysis due to heterogeneity of the study designing and participant characteristics.

Results
We included 21 eligible studies that involved 26994 participants. Studies were heterogeneous for the designing and participant characteristics. Two studies reported stroke incidence in RHD patients’ population which was 4.5% per patient-year in America by 1978 and 5.9% in China 30 years later by 2008. Eight studies reported stroke prevalence in RHD patients’ population. It ranged from 0.37% to 12.6% in Asia in recent three decades. Ten studies reported the proportion of RHD in stroke patients with data from the past three de-
decades. The proportion of RHD in patients with ischemic stroke ranged from 3.4% to 23.2% in Asia and 1.8% to 2.0% in Europe and Northern America. Six studies reported case-fatality in stroke patients with RHD. It ranged from 8.5% to 47.4% in Asia in recent three decades and was 49.2% in America by 1951.

Conclusion
In recent decades, stroke due to RHD still represents a hidden burden that cannot be ignored for developing areas such as Asia, although reliably estimated data cannot be acquired from current studies. Future community-based studies should be conducted to monitor current trend of stroke and RHD in these areas.

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Progesterone for experimental ischaemic stroke: an individual animal meta-analysis
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Background
Progesterone is a potential neuroprotectant following experimental cerebral ischaemia. This study assesses progesterone in an individual animal data (IAD) meta-analyses.

Method
Studies assessing progesterone in animal models of focal stroke were identified through electronic searches and reference lists. Authors of published and unpublished data were invited to join PISA and share their IAD, including information on experimental procedures, drug administration (loading, maintenance), outcomes (standardised lesion volume with death imputed) and potential sources of bias. The data were merged into a database. Multi-level models were built to compare progesterone with control taking into account differences between trials for both IAD and summary data.

Results
IAD was shared for 14 published studies, 2 unpublished studies, and data from excluded animals. Data from 689 animals were collected with the final model involving 337 animals from 12 studies. In combined analysis of IAD and summary data, progesterone reduced lesion size (SMD -0.62, 95% CI -1.03 to -0.22, p<0.001).

In multi-level models, progesterone reduced lesion size (SMD -0.41, 95% CI -0.79 to -0.04, p=0.031), with larger maintenance doses producing smaller lesions (SMD -0.005, 95% CI -0.008 to -0.0009, p=0.015). Sub-group analyses showed that treated males (SMD -1.30, 95% CI -2.52 to -0.09, p=0.037), ovarectomised female mice (SMD -2.21, 95% CI -3.78 to -0.639, p=0.007) and animals <12 months of age (SMD -0.593, 95% CI -1.033 to -0.153, p=0.011) had smaller lesions as compared to controls.

Conclusions
In an IAD meta-analysis of experimental stroke, progesterone was neuroprotective exhibited as a reduction in lesion volume. However, the effect of progesterone in old, hypertensive, and diabetic animals remains to be demonstrated.
Antibiotic therapy for preventing infections in patients with acute stroke
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Background Stroke is the main cause of disability in high income countries and ranks second as a cause of death worldwide. Infections occur frequently after stroke and may adversely affect outcome. Preventive antibiotic therapy in the acute phase of stroke may reduce infections and improve outcome.

Objectives To assess whether preventive antibiotic therapy in patients with acute stroke reduces infection rate, the risk of dependency and the risk of death at follow-up.

Methods We searched the Cochrane Stroke Group’s Trials Register, CENTRAL, MEDLINE and EMBASE for randomised controlled trials (RCTs) of preventive antibiotic therapy versus control (placebo or open control) in patients with acute ischaemic or haemorrhagic stroke. Two authors independently selected articles and performed data extraction. An independent observer assessed methodological quality. We calculated relative risks (RRs) for dichotomous outcomes, assessed heterogeneity amongst included studies and performed subgroup analyses on study quality.

Main results We included five studies involving 506 patients. Study population, study design, type of antibiotic and definition of infection differed considerably. The number of patients who died in the preventive antibiotic group was non-significantly reduced (33/248 (13%) vs. 38/258 (15%), RR 0.85, 95% CI 0.47 to 1.51); the number of dependent patients in the preventive antibiotic therapy group was also non-significantly reduced (97/208 (47%) vs. 127/208 (61%), RR 0.67, 95% CI 0.32 to 1.43). Pre-ventive antibiotic therapy did reduce the incidence of infections in patients with acute stroke from 36% to 22% (36/166 (22%) vs. 61/169 (36%), RR 0.58, 95% CI 0.43 to 0.79).

Conclusions In this meta-analysis, preventive antibiotic therapy seemed to reduce the risk of infection, but did not reduce the number of dependent or deceased patients. However, the included studies were small and heterogeneous. Large randomised trials are urgently needed.
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Background: Randomized controlled trials (RCTs) are the most important evidence to guide clinical practice in the treatment of acute stroke. This study was to evaluate the methodological quality and outcome measures of RCTs for acute stroke in Mainland China from 1996 to 2010.

Method: We included acute unconfounded stroke RCTs from nine databases published in Chinese or English language, from 1996 to 2010. General characteristics, design methodology and outcome measures of studies were assessed. Result: Totally 9061 RCTs were identified. 3488 trials (38.5%) involved in Western drugs, 3026 (33.4%) trials in Traditional Chinese medicine and 1933 (22.0%) trials in physical therapy. Ischaemic stroke was the most common researched condition in all trials (65.1%, 5989), followed by intracerebral haemorrhage (1857, 20.5%), Subarachnoid haemorrhage (304, 3.4%). The number of acute stroke RCTs increased by years, the amount of trials published in 2010 was 20 times of that published in 1996. But important methodological components of RCTs were reported in few trials, such as random sequence generation (reported in 5.9% of RCTs), blinding (2.9%), allocation concealment (0.4%), analysis of intention to treat (0.1%), primary outcome (0.4%). During 15 years, only the proportion of trials reporting the random sequence generation, adverse events has been significantly increased (p<0.001) respectively. Outcomes were assessed blindly in 72 trials. Death was recorded in 14.2% of trials but only 199 studies took it as an outcome measure. The impairment was the most commonly outcome measure in Chinese stroke RCTs (85.1%). Duration of follow up ranged from 3h to 3 years (median 21, interquartile range 14-30 d). 99.7% of trials reported positive result.

Conclusion: During 15 years, the number of trials has increased dramatically, but the quality of acute stroke RCTs improved slowly. Most acute stroke trials used clinical outcome measures that were inadequate in terms of their content, reliability, validity, blinded assessment.
Blood-pressure-lowering treatment for prevention of recurrent stroke: a systematic review and meta-analysis

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Background: Elevated blood pressure is a risk factor for recurrent stroke. We studied the effectiveness of blood-pressure-lowering drugs in reducing stroke recurrence as part of a Cochrane review in progress.

Methods: We performed a systematic review and meta-analysis. The trial registers of the Cochrane’s Stroke – and Hypertension Group were searched, as were the references of the retrieved journal articles. Studies were included if they were randomised controlled trials (RCTs) that assessed antihypertensive treatment in patients with stroke or transient ischaemic attack (TIA), compared to a control group (placebo or no treatment) and reporting on recurrent stroke (fatal and non-fatal). Studies assessing the effect of blood-pressure-lowering during the acute phase of stroke were excluded. Data were entered into the Cochrane Collaboration Review Manager package. Odds ratios (ORs) and 95% confidence intervals (CIs) were calculated with random effects models because we expected a high level of heterogeneity of the included studies. We used Mantel-Haenszel statistics to obtain a pooled odds ratio.

Results: Nine RCTs met the inclusion criteria. They varied in class of antihypertensive drugs, baseline blood pressure (normotensive vs hypertensive), stroke types included, length of follow-up and time from stroke to inclusion in the study. The combined sample size was 36630, of whom 18357 received active treatment, 18130 received placebo and 143 received nothing. Lowering blood pressure with various antihypertensive drugs significantly reduced stroke recurrence (OR 0.72; 95%CI 0.58-0.88). The studies had a high degree of heterogeneity (I² = 80%) (figure).

Conclusion: Meta-analysis of all available data from RCTs shows that blood pressure lowering treatment in the sub-acute to chronic phase after stroke is effective in reducing recurrent stroke.

The antifibrinolytic therapy in the management of aneurismal subarachnoid hemorrhage revisited. A meta-analysis.

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Background: To reassess the use of antifibrinolytic therapy in the management of aneurismal subarachnoid hemorrhage.
brinolitics (AF) in the management of aneurysmal subarachnoid hemorrhage (SAH) in the setting of present day treatment strategies.

Method: The authors conducted a systematic review of the literature and a meta-analysis. They reviewed PubMed and conducted a manual review of article bibliographies. Results: Using a pre-specified search strategy, 17 relevant studies involving a total of 2872 patients with SAH at baseline, from which data 1380 patients having received AF, were included in a meta-analysis. Pooled odds ratios of the impact of AF on functional outcomes, rebleeding, and cerebral infarction were calculated. Short term use of AF (72 hours or less) associated with medical prevention of ischemic deficit seems to yield better results on functional outcome than long term use of AF especially if not associated with a medical prevention of ischemic deficit. The risk of cerebral infarction is not increased by the short term use of AF and the risk of rebleeding is decreased independently of the length of AF use.

Conclusions: The use of AF should be reconsidered in the setting of modern era treatment strategies, as the short term use associated with medical prevention of ischemic deficit decreases the rate of rebleeding and does not increase the risk of cerebral infarction, thus potentially yielding an better protection against poor functional outcome.

445 Meta-analysis and reviews

What is the frequency of depression in people who provide informal care to stroke survivors?

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Background: Reliable data on the incidence and prevalence of depression in people who provide informal care to stroke survivors are useful for informing the development of clinical trials, planning services for stroke survivors and carers, and for the development of effective public policy. However, data on the prevalence of depression in
informal carers of stroke survivors are conflict- ing. This systematic review and meta- analysis was undertaken to obtain valid and precise estimates of the occurrence of depression in people who provide informal care to stroke survivors.

Methods: Data from relevant studies (co- hort, case-control, or cross sectional stud- ies) were identified through literature searches of MEDLINE, EMBASE, CI- NAHL AMED and eight other databases. Studies were included if the focus was on: study carers of stroke survivors living in the community, had no restrictions on admissi- ble participants, had no restrictions on type of stroke patient, and depression measured using standard criteria. Two review authors selected studies for inclusion, independent- ly extracted data and assessed methodologi- cal quality. Estimates of pooled prevalence were calculated using inverse variance methods.

Results: 19 studies were identified. 12 studies used a single cohort design and six studies used a cross sectional design. One study is ongoing. Data on prevalence of depression were available from 16 studies (1848 participants). No studies collected data on incidence of depression. The estimates of prevalence of depression are based on the number of people who scored above a clinical cut point on a self-report dimensional rating scale for depression. The overall pooled prevalence estimate calculated using the inverse variance method was 28% (95% Confidence interval 23%, 33%). Lack of a clear and unambiguous operational defi- nition of informal care is common across studies.

Conclusions: Estimates of prevalence of depression informal carers of stroke sur- vivors are lower than previous published estimates. It is important to note that prevalence does not indicate a cause and ef- fect relationship between informal care and depression.
Objective: Haematoma growth is a key prognostic factor in intracerebral haemorrhage (ICH) but the size of the relationship to clinical outcomes is uncertain. We aimed to quantify relationships between haematoma growth parameters and clinical outcome in the pilot phase, Intensive Blood Pressure Reduction in Acute Cerebral Haemorrhage Trial (INTERACT1).

Methods: In randomised patients with both baseline and 24-hour brain CT (n=335), associations between measures of absolute and relative haematoma growth and 90-day poor outcomes of death and dependency (modified Rankin Scale score 3-5) were assessed in logistic regression models, with data reported as odds ratios (OR) and 95% confidence intervals (CI).

Results: A 10.7 ml increase (1 SD) in haematoma volume was associated with a 1.4-fold increase in the odds of poor outcome (95% CI 1.1-1.8). A 10.7 ml increase (1 SD) in haematoma growth rate was associated with a 1.7-fold increase in the odds of poor outcome (95% CI 1.2-2.5).

Conclusions: Haematoma growth is a promising therapeutic target in ICH. Further efforts are needed to identify those studies that should be advanced to phase III trials.
Background
The Scandinavian Candesartan Acute Stroke Trial (SCAST) showed no beneficial effect of blood pressure lowering treatment with candesartan in patients with acute stroke and raised blood pressure. The aim of this study is to assess the effects of candesartan on cognitive function and quality of life at 6 months.

Methods
SCAST was an international multicentre, randomised- and placebo-controlled, double masked trial of candesartan in 2,029 patients with acute ischaemic or haemorrhagic stroke. We used the Mini Mental State Examination (MMSE) and the EQ-5D for assessment of cognitive function and quality of life, respectively. The five EQ-5D health states were dichotomised into “having problems” or “having no problems”, and were analysed by the Chi-square test. We used the Mann-Whitney U test for the analysis of MMSE and the EQ-5D visual analogue scale (VAS).

Results
Data on MMSE, the five EQ-5D health states and the EQ-5D VAS were available on 1,642 (81%), 1,734 (85%) and 1,697 patients (84%), respectively. The median MMSE was 28 and the median EQ-5D VAS score was 70 in both the candesartan and the placebo groups (Figure). For all the five EQ-5D health states there were small, non-significant differences in disfavour of candesartan (Table).

Conclusion

448 Large clinical trials (RCTs)

Effects of candesartan in acute stroke on cognitive function and quality of life at 6 months
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matoma volume over 24 hours was strongly associated with poor outcome (adjusted OR 1.78, 95% CI 1.24-2.56; p=0.002). An association was also evident for relative growth (adjusted OR 1.74, 95% 1.28-2.35; p=0.0004 for 1 SD increase). The analyses were adjusted for age, sex, antithrombotic use, clinical severity, baseline volume and location of haematoma, intraventricular extension, and study treatment. A 1 ml increase in haematoma growth was associated with a 6% (95% CI 2-9%) higher risk of death or dependency. This is consistent with the 2 ml reduction in haematoma growth associated with a 10% reduction in the risk of death/dependency in the FAST trial (n=841).

Conclusion: Promising treatments such as rapid BP lowering or haemostasis, that produce plausible 2-4 ml reductions in haematoma growth, could still translate into improve outcomes of 10-20% in relative terms.
Candesartan in the acute phase of stroke has no beneficial effects on cognitive function or quality of life at 6 months. These results support the main findings in SCAST, that there is no indication for routine blood pressure lowering treatment with candesartan in the acute phase of stroke.

Background:
Previous studies with Cerebrolysin have shown promising neurotrophic and neuroprotective properties in patients with acute ischemic stroke. The aim of this large double-blind placebo-controlled randomized clinical trial was to test its efficacy and safety in such patients.

Methods:
Patients with acute ischemic hemispheric stroke in Asia were randomized within 12 hours of symptoms onset to active treatment (30 ml Cerebrolysin daily) or placebo (saline solution) given once daily as i.v. infusion for 10 days in addition to aspirin. The patients were followed up to 90 days. The primary endpoint assessed the modified Rankin Scale (mRS), Barthel Index (BI) and NIH Stroke Scale (NIHSS) in a combined global directional test. Adverse events were documented to assess safety.

Results:
1070 patients were enrolled in this study. 529 patients were assigned to Cerebrolysin and 541 to placebo. The confirmatory endpoint showed no significant difference between the treatment groups. After stratification by severity however, a post-hoc analysis of NIHSS and mRS showed a trend in favor of Cerebrolysin in patients with NIHSS>12 (NIHSS: OR = 1.27, CI-LB = 0.97; mRS: OR = 1.27; CI-LB = 0.90). In this subgroup the cumulative mortality by 90 days was 20.2 % in the placebo and 10.5 % in the Cerebrolysin group (HR = 1.9661, CI-LB = 1.0013). Cerebrolysin was gener-

449 Large clinical trials (RCTs)

CASTA - Results of a Double-Blind, Placebo-Controlled, Randomized Trial with Cerebrolysin on patients with Acute ischemic Stroke in Asia
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ally well tolerated. 

Conclusion: 
In this study the confirmatory endpoint showed neutral results between the treatment groups. However a favorable outcome trend was seen in the severely affected ischemic stroke patients treated with Cerebrolysin. This observation should be confirmed by a further clinical trial.

ClinicalTrials.gov identifier: NCT00868283

450 Large clinical trials (RCTs)

Is long-term adherence to CPAP treatment different between stroke and cardiac patients with obstructive sleep apnea (OSA)? Results of the SAVE trial

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Background: We aimed to determine predictors of long-term adherence to continuous positive airway pressure (CPAP) in the ongoing Sleep Apnea cardioVascular Endpoints (SAVE) study (NCT738179), an international randomised controlled trial to determine whether this treatment can prevent major cardiovascular (CV) events in minimally-symptomatic moderate-to-severe OSA patients with prior stroke or cardiac disease.

Methods: In 275 patients randomised to CPAP prior to July 2010 with complete 12 month adherence data, linear mixed modelling was used to determine predictors (based on variables with p<0.10 on univariate analysis) of average hours of daily CPAP use at 12 months.

Results: Univariate predictors of 12-month CPAP adherence (average 3.3±2.4 hours per night) included baseline Epworth Sleepiness Scale (ESS), snoring loudness, hours of daily use during an initial 1-2 week ‘sham CPAP’ run-in, and CPAP adherence and side effects at 1-month. Entry disease type, cardiac or stroke, was not associated with CPAP adherence (p>0.10 at univariate).
Conclusion: Long-term use of CPAP in patients with co-occurring moderate-to-severe OSA and CV disease is predicted by early (1-month) degree of adherence and its tolerability. Level of adherence was similar between cardiac and stroke patients.

2001 Acute stroke: clinical patterns and practise including nursing

Nursing Interventions in Connection with Dysphagia in Acute Stroke Patients
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Background:
Studies show that 37-78 % of acute stroke patients suffer from dysphagia and dysphagia increases the risk for pneumonia by three times. Studies among elderly hospitalized patients show that impaired oral hygiene also represents a risk for developing pneumonia.
At the same time studies show that increased oral hygiene prevents infections in the respiratory tract among residents in nursing homes and intensive care units.
Good oral hygiene presumably reduces the patients suffering as well as saves money when preventing pneumonia and reducing the patients length of stay in hospital.
Traditionally screening for dysphagia is the occupational therapists assignment, but in the absence of therapists it is important for nurses to be able to assess patients and initiate adequate interventions.
Methods:
This poster shows how to organize screening for dysphagia, control of nasogastric tube location, oral hygiene and calculate sufficient oral
Energy for patients with dysphagia without nasogastric tube

Results:
The poster shows a flow diagram of nursing interventions in connection with dysphagia in acute stroke patients.

Conclusion:
Following the flow-diagram is immediately time consuming but reduces the use of time for estimating the patient's needs. The use of flow-diagram accelerates inserting nasogastric tube after stroke onset, fewer patients wait for X-rays as control of tube location, and presumably fewer patients are weakened by malnutrition.

2003 Acute stroke: clinical patterns and practice including nursing

Stroke Support Group like a Float
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Stroke is an acute and dramatic disease. The acuteness and severity of strokes are associated with significant difficulties to cope with the new disability and dependency. Following strokes the world of patients and family members changes, and they remain uncertain regarding their future. Education and support groups are one of the most effective ways of dealing with fears and uncertainties. Support groups provide knowledge that in turn helps patients and family members deal with the shock of the event and adapt to new situation. Support groups also enable participants to share with others their problems, difficulties and learn from the experience of others.

In the past 5 years we offer a single session educational and support group for all stroke patients and family members admitted to the Department of Neurology. In this session we supply the participants with information regarding their disease using an oral presentation and written brochures. In addition we have an open live dialog between the moderator and group members. Our patient population is heterogeneous and multicultural. We utilize this heterogeneity to show the common fundamental problems and difficulties associated with the new situation.

On feedback written questioners participants of the Stroke support groups expressed marked satisfaction with both the information presented and its potential future use after discharge. They emphasized the importance of non judgmental self expression during the discussions.

We also use the questioners for ongoing improvement of the rehabilitation process. Moreover, we recently extended stroke support groups to the internal medicine departments.

Our experience shows that heterogeneous educational and support groups help stroke patient and family members cope with the acute crisis, significantly increase satisfaction regarding hospitalization, reduce anxiety, anger, despair and helplessness and provide strength and hope for a better future.
Stroke is the leading cause of disability in the developed world. Previous studies have shown that early and comprehensive rehabilitation improves long-term disability in stroke patients. Multiple health professionals contribute data regarding stroke patients. These include physicians, nurses, physiotherapists, occupational therapies and social workers. As a result, the data required for planning and early initiation of rehabilitation treatment frequently are fragmented and incomplete.

In our institution, we developed a new Oracle-based computerized application summarizing data from all medical professionals who treat stroke patients. This is the first attempt in Israel to integrate efforts of all medical professionals dealing with stroke patient. Our newly formed computerized database has the following advantages:

- An objective evaluation of the patient according to standardized measures.
- Early initiation of rehabilitation in the Neurology Department.
- A close multidisciplinary collaboration between physicians, nurses, social workers, physiotherapists and occupational therapists.

Our experience indicates that the use of newly developed computer-based application integrates the data from all members of multidisciplinary team and improves treatment and rehabilitation of stroke patients.
“80% of the stroke patients can achieve their best functional abilities at 6 weeks of rehabilitation and 90% achieve it at 12.5 weeks”. Only 5% of the patients will improve their functional and neurologic abilities if rehabilitation is started after 3 months. Objectives: Describe the patients’ functional improvements in our Stroke Unit. Methodology: The Barthel Scale was applied when patients were bed elevated for the first time and at patients” hospital discharge (total of 100 patients). Patients deceased, with diagnosis of sub-arachnoida bleeding and whose scale was not fully filled in were excluded. Results: Fifty two percent of our sample had male patients and 60% of our patients had more than 65 years old. Most patients were belowaffected by ischemic stroke (78%). At patients first elevation from the bed, 14% of them were total dependent, 44% had a severe dependency, 27% had a moderate dependency, 6% had a light dependency and 9% were independent. At patients’ discharge, only 9% were still total dependent, 21% had a severe dependency, 28% had a moderate dependency, 8% had a light dependency and 34% were independent. Male patients with 65 years old and below affected by an ischemic stroke and with a ≤ 4 day hospital stay were the ones who presented the higher functional improvements. Most of the patients were directly discharged to their homes. Patients with severe and moderate dependency were transferred to rehabilitation units. Conclusion: Patients admitted in a stroke unit, where rehabilitation by a multidisciplinary team is immediately initiated and continued on the following 24h, present higher improvements in their functional independency. References: 1Direcção Geral de Saúde (2010). Acidente Vascular Cerebral: Itinerários clínicos. Lisboa: Lidel Editora; p.9. Ramires (1997) In Direcção Geral de Saúde (2001). Unidades de AVC. Lisboa: p.7.

2006 Acute stroke: clinical patterns and practise including nursing

The appropriate body position during Nasal-Gastric tube feeding (NGF) to prevent the aspiration pneumonia in acute stroke patients


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Purpose

In acute stroke patients when initiating Nasal-gastric tube feeding (NGF) have a high risk for aspiration pneumonia, which may be related to the body position. We investigated the relationship between body position during NGF and aspiration pneumonia. Methods We enrolled consecutive acute stroke patients, 1) who were admitted from June to October 2011, 2) with a diagnosis of acute stroke within five days, and 3) who initiated NGF within two days from admission due to altered mental state or severe dysphagia. We allocated these enrolled patients into
two Group alternately according to the body position during NGF; patients in the complete lateral position (Group L [n=17]) with keeping nonparalyzed side below and head up at 30-60 degrees during NGF, and patients in the spine position (Group S [n=16]) with head up at 30-60 degrees. We evaluated patients’ baseline characteristics including neurological status and vital signs, inflammatory response parameters, and the number of patients with aspiration pneumonia. Aspiration pneumonia fit three criteria: 1) at least one event of aspiration during NGF, 2) infiltrative shadows on the plain chest radiograph, and 3) no evidence of community acquired pneumonia. Result We finally evaluated 26 patients (median age was 84.5 years old, 61.5% female). There were 16 patients with cerebral infarction and 10 with intracranial hemorrhage, median NIHSS score on admission was 17.5, and on the seventh day was 17. We analyzed 15 patients in Group L, and 11 in Group S. There was no difference in patients’ baseline characteristics, choice and duration of the antibiotic use, and inflammatory reaction parameters between the groups statistically significantly. However, the patients with aspiration pneumonia after admission was lower in Group L compared to Group S statistically significantly ( one case in Group L, 5 cases in Group S, P=0.036).

Conclusion The complete lateral position during the NGF has the potential to prevent aspiration pneumonia for acute stroke patients

2007 Acute stroke: clinical patterns and practise including nursing

Admission sources and triage of all stroke admissions to a non-emergency campus following reconfiguration in a major UK teaching hospital trust.

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Reconfiguration of stroke services in a major UK teaching hospital in August 2010 resulted in all stroke admissions being centred on a non emergency campus. Pre admission triage by ambulance crews and family practitioners aimed to reduce the number of non stroke admissions to this pathway. The stroke specialist nurse is the first individual to meet the patient on arrival and consequently has required increased diagnostic skills to fulfil this new role.

In the first 4 months of our study period the stroke nurse specialist also triaged all phone calls to the service, this role was reversed later in the study with phone calls being triaged by a stroke neurologist.

We were interested in the accuracy of the referral diagnosis, and the differences in referral patterns when nursing and medical staff were in charge of telephone triage. To answer the question we undertook a retrospective review of admissions in a 9 month period. There were 1368 patients admitted. The final diagnosis of non stroke after assessment based on referral source are as follows ; ambulance service 27.1%, Family Practitioners 37.9%, Acute medicine Physicians 30.7%.

When calls were triaged by stroke nurses
39.4% of admissions were non stroke or TIA, in the second 4 month period 34.9% of referrals were non stroke. The major difference noted was a in the number of admissions to the service from family practitioners when a medical consultant carried the bleep with a 20.2% reduction in admissions from this pathway.

This suggests that nurse specialists are almost as efficient at screening as medical staff and warrants future study. It also shows that telephone screening is very in efficient in detecting stroke as a diagnosis.

2008 Acute stroke: clinical patterns and practise including nursing

What are the contributions made by stroke nurses in the thrombolysis treatment? An experience of one hyperacute stroke unit in London
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Introduction: Stroke is the third biggest killer in the United Kingdom. The Department of Health has introduced hyperacute stroke units (HASU) across London as part of the new stroke model in 2010. The concept of the HASU is to ensure that stroke patients receive specialist stroke care from multidisciplinary experts in the first 72 hours following a stroke or until their condition is stable, before being transferred back to their local specialist stroke unit. A HASU provides thrombolysis treatment for eligible patients. As a new model, the nurses from the hyperacute stroke units are involved as part of the thrombolysis team. The aim of the study is to evaluate the roles of stroke nurses in participating in the delivery of thrombolysis treatment for acute ischaemic stroke. Method: In order to prepare the stroke nurses for the role, the nursing team, consisting of a clinical nurse specialist and ward manager, has developed a training program and a thrombolysis competency workbook. Before the opening of the HASU on July 2010, the stroke nurses were given 2 to 3 months to work with the stroke nurse specialists and doctors to help achieve their competencies. Result: From July 2010 to December 2011, the stroke nurses’ contribution to the thrombolysis treatment delivered the most efficient way of communicating with the stroke team and patients, facilitated the thrombolysis process in a timely fashion, prepared and administered medications, improved door to needle time, monitored post-thrombolysed patients, identified early signs of complications, and were a valuable help in providing support to patients and family. Conclusion: Nurses are an integral part of the thrombolysis team. Continuous educational support from the medical team is essential to enhance and develop the stroke nurses’ thrombolysis roles. Their roles have significant impact in improving the delivery of the thrombolysis treatment.

2009 Acute stroke: clinical patterns and practise including nursing

How to implement competencies in one hyperacute stroke unit in London?
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Introduction: Hyper Acute Stroke Units (HASUs) admit all acute stroke patients across London. Implementation of the London stroke model resulted in significant recruitment of 400 nurses, many new to stroke as a specialty. With this, a clear need for standardized competencies for nursing staff across London emerged. In the absence of a nurseeducator the role of ensuring the competency was completed fell to the senior nurses of the stroke service. HASU competencies, developed by the London Stroke Networks in 2011 encompass all of the 10 key areas of HASU nursing care. The challenge from the nursing team of Imperial College Health Care Trust (ICHT) being one of the HASUs is the actual implementation of the competencies of more than 100 nursing staff with a limited number of mentors. Methods: The ICHT nursing team consisting of stroke nurse specialists and ward managers has utilized a “training a mentor” approach to increase the number of mentors. The ICHT nursing team trained and assessed 12 senior stroke nurses from the HASU using a competency workbook, which they were required to complete in 2 months. A three day stroke course and a protected one hour session were provided to these nurses to support their learning experience. Once senior stroke nurses are deemed competent, they will be given 5 to 8 nursing staff to help them to achieve their competencies within 6 to 12 months. Results: To date, 12 senior nurses and more than 80 junior nurses have attended the 3–day stroke course covering the HASU stroke care. The nursing team developed 12 senior nurses as mentors and are currently assessing the junior nurses to complete the competency. It is planned that all stroke nurses will have completed the document by the end of 2012. Conclusions: Appropriate support and training are key elements for senior nurses to develop their mentoring roles. A “protected one hour session” is highly recommended to provide a focused and practical learning opportunity in achieving competencies of nurses in stroke care. A “training a mentor” approach facilitates a supportive learning climate, motivates nursing staff, and helps nurses to achieve their competencies in a busy hospital.

2010 Acute stroke: clinical patterns and practice including nursing

Suspected stroke patients identified by nurses at the EMCC and the ambulance.

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Background

If stroke is suspected at a call to the Emergency Medical Communication Center
EMCC) it may generate a higher priority which could result in early initiated treatment and a better outcome. Based on the Face-Arm-Speech-Time test (FAST) and/or own suspicion nurses at the EMCC included adult patients with suspected stroke within 6 h of onset in the Hyper Acute Stroke Alarm study (HASTA). The EMCC identified 667 patients; an additional 233 patients were identified by the nurses in the ambulance at scene. This raised the question whether the characteristics of the patients differed.

Methods
The FAST symptoms were noted in all patients by the nurses in the ambulance at scene. The FAST symptoms found in the group identified by the EMCC were compared to those in the patients identified by the ambulance.

Results
Half (n 337) of the patients identified by the EMCC had a diagnosis of stroke/TIA at discharge compared to 58% of those identified by the ambulance. At least one FAST symptom was noted in 48% and 72% in the EMCC- and ambulance identified groups, respectively. Facial weakness was noted in 26% and 42%, arm weakness was noted in 27% and 48%, and speech disorders were noted in 36% and 55% in the EMCC and ambulance groups, respectively.

Conclusion:
The fact that one fourth of the patients were not identified as suspected stroke until the ambulance arrived at scene is not explained by an absence of FAST symptoms. The patients identified by the nurses in the ambulance show a higher presence of FAST symptoms. FAST identifies mainly symptoms from the carotid circulation but as we found FAST symptoms to be present to an even higher degree in the patients not identified until the ambulance arrived this can not be the reason. What make the medical dispatcher to suspect or not to suspect a stroke could in this study not be explained by differences in noted symptoms and warrant further studies.

2011 Acute stroke: treatment concepts for physiotherapists and nurses

The impact of an high intensive exercise program on gait after stroke: a randomized controlled trial
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Stroke often results in asymmetric gait with disturbed balance, which may increase the risk of accidental falls.

The purpose of this study was to evaluate the impact of a high intensive exercise program after stroke on gait variables. 34 post-stroke individuals with risk of falls were included in this five week randomized controlled trial. The participants were assessed, included and randomized to either intervention group (IG) or control group (CG) at 3 to 6 months after stroke onset.
The IG received a high intensive strength and balance exercise program along with a weekly educational group discussion on fall risk and security aspects, whereas the CG received weekly group discussions on hidden dysfunctions after stroke. The groups were led by Physiotherapists and an Occupational therapist. Assessments were made before, post-intervention and at 3-months follow-up.

Gait variability improved after the intervention for the IG compared to the CG both at the post-intervention assessments and at the three-month follow-up assessments. Statistically significant (p<0.05) improvements were seen in the IG vs. the CG at post intervention compared with baseline in double support time for the non-paretic leg (DSTnp), variability (measured as coefficient of variation, CV) in Step Time for the paretic leg (STCVp) and the non-paretic leg (STCVnp), and in variability in Cycle Time for the paretic (CTCVp) and non-paretic leg (CTCVnp); at 3-months follow-up compared with baseline in DSTnp, STCVp, CTCVp and CTCVnp, and variability in Double Support Time for the paretic leg.

At 3-months follow-up, the decrease in the STCVnp and the variability in Step Length of the non-paretic leg (SLCVnp) were more pronounced in the CG than in the IG.

The findings suggest that high intensive exercise programs have a positive effect on gait, and can be useful in diminishing gait asymmetry as a fall-risk factor in people after stroke.

**2012 Acute stroke: treatment concepts for physiotherapists and nurses**

**Improving Communication Between the Clinical Staff in Stroke Rehabilitation Using Simple Visual Information**

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**Introduction**

Clear and accurate information is an essential requirement when working within an integrated care team to provide effective and efficient rehabilitation for recovery following stroke.

Communication includes therapists identifying and liaising with the nursing staff the type of equipment/aid that would be appropriate for a patient’s transfer or mobility. Verbal and written communication of this information was proving to be unsuccessful, therefore it was decided to explore and improve this communication using a different method.

**Method**

An initial questionnaire was sent to the nursing team and physiotherapists working with stroke patients in the acute and rehabilitation setting. This was used to measure how individuals felt about the interdisciplinary communication of a patient’s transferring and walking ability. The questionnaire identified lack of awareness of how a patient should be transferring, poor perception of approachability between clinical staff and 80% fed back the current
Background: Gait deficits contribute considerably to functional disability after stroke, and the regaining of walking ability is a major goal in most stroke rehabilitation programs. The synthesis of the evidence suggests that a multimodal approach can lead to improved outcomes. Therefore, the aim of this systematic review is to provide important insights into the specific interventions of physical therapy that have been shown to be efficacious for gate recovery after stroke.

Methods: We searched MEDLINE, EMBASE, CINAHL, and PEDro up to October 2011. We also handsearched relevant conference proceedings, clinical practice guidelines and specialist books. We included randomised controlled trials and randomised cross-over trials. Two review authors independently selected trials based on inclusion criteria, documented methodological quality using the PEDro Scale, and extracted data.

Results: We included 8 studies with a total of 390 participants that compared multimodal therapy to other interventions for gait recovery after stroke. The median possible PEDro score of all included studies was six points. Based on our analysis, the multimodal approaches researched focused on task practice, strength training, cardiorespiratory fitness and endurance.

Conclusions: The current level of evidence for multimodal interventions is limited, because most trials are small with design limitations and with brief descriptions of the specific interventions. However, the evaluation of the sum of these studies suggests that physical therapy for gate recovery after stroke should elicit motor activity in order to improve outcomes.
Data on visual scanningscompensation training in 4 patients with hononymous hemianopia caused by stroke.
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The incidence of hemianopia after stroke is approximately 50%. Presence or absence of hemianopia is an important determining factor of the rehabilitation results and functional outcome.

Treatment of hemianopia is based on ‘best practice’ protocols of M. Vankessel (2010). We measure the founded items and reaction times of projected numbers on a 2 m wide screen, film the erratic and inefficient head movements and searching patterns towards the hemianoptic field.

We roughly measure the visual field with a laser pen.

Patients with cognitive and executive dysfunctions, aphasia and severe psychiatric problems are excluded from this specific therapy.

The training takes 12-15 sessions, 3 times a week for approximately 30 minutes. Sessions consists of psycho-education (visual system, the importance of ‘overshoots’), screen training (projection on a 2 m wide screen), combined with reading and occasionally copying matrices.

We present 4 patients with a clearly diminishing hononymous hemianopia. Patients notice a generalisation of the acquired skills towards daily functioning (reading subtitles, doing groceries in the supermarket...)

We have not yet seen long term results from retesting to show the lasting effect of the compensation training.

Vestibular rehabilitation after stroke
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Background: Patients with vestibular dysfunction after stroke have measurable impairment of motor control, especially during the execution of tasks that require balance, cephalic rotations and good dynamic visual acuity. The aim of this study was to assess the effects of vestibular rehabilitation in patients with central vestibular dysfunction after stroke.

Method: We evaluated eight patients with diagnosis of ischemic stroke by means of static balance test clocking the time spent in each posture with eyes closed under foam of density 28, without the influence of sensory stimulation of the feet; and dynamic balance, such as Time up and go (TUG), Functional Reach...
Introduction: Lesions of the right hemisphere, especially the parietal lobe, often lead to sensory or visuospatial neglect the contralateral side and to a lesser intensity of the ipsilateral side. The aim of this study was to evaluate the effect of transcutaneous-
sensitive electrical nerve stimulation (TENS) in an individual with sensory and visuospatial neglect after stroke. Method: Patient JS, 45, woke on 11.17.2011 with decreased muscle strength on the left side of the body. Immediately went to the Hospital of the Botucatu School of Medicine and was diagnosed by computed tomography as right fronto-temporo-parietal ischemia, progressing to hemiparesis, hemianopsia, sensory and visuospatial neglect on the left side. He was referred to the rehabilitation sector and initial evaluation consisted of specific protocols for sensory and visuospatial neglect, such as, Face-Hand Test (FHT), Albert’s Test (AT) and Line Bisection Task (LBT). The tests were performed in two situations: connected with the TENS (TENS-ON) and off (OFF-TENS). The scores of three tests was compared in both situations in the first ten sessions the treatment. The TENS was placed on the posterior side of the neck and left shoulder, with frequency (f): 100 Hz and pulse width (T): 100 ms for 30 minutes.

Results: The mean of the results in the first 10 sessions with the TENS-off were: FHT (Right - Face: 7, Hand: Simultaneous 8 and 0; Left - Face: 6 Hand: 7 and Simultaneous: 0), the AT 3 errors on the right side and 12 on the left, the LBT showed +81.79; with TENS-ON were FHT (Right - Face: 10, hand: 8, and Simultaneous: 3; Left - Face: 9, hand: 8 and Simultaneous: 0); the AT 0 errors in the right and 1 on the left and LBT showed +35.99. Conclusion: The use of TENS reduced errors in the individual neglect and the results suggest that this procedure can improve the patient’s perception of space on both sides.

**2017 Clinical care in dementia and behavioral changes after stroke for nurses**

**Relationship between executive dysfunction and physical function post-stroke**

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**Background**

Executive dysfunction is common post-stroke and may negatively impact physiotherapy rehabilitation. This study investigated the relationship between executive function (EF) and physical function post-stroke.

**Methods**

Participants were included in this cross-sectional study if they were: <6 months post first stroke, not aphasic, had no pre-stroke vascular dementia and/or other neurological conditions. EF was measured by the Behavioural Assessment of Dysexecutive Syndrome (BADS). The Motor Assessment Scale (MAS), Barthel Index (BI), Berg Balance Scale (BBS), Scandinavian Stroke Scale (SSS), Geriatric Depression Scale (GDS) and Mini Mental State Examination Score (MMSE) were also used. Comparisons were made between participants with ED and without ED using independent t-tests. Multiple linear regression analyses determined independent predictors of MAS, BI and BBS.

**Results**

Participants (n=95) were of mean (SD) age 70.61 (12.21) years, 1.10 (1.23) months post-stroke, had education of 11.61 (3.67) years. Participants with ED performed significantly poorer than participants without ED in the SSS, MMSE, MAS, BI, BBS.
and GDS (p< 0.05). MAS score was independently predicted by MMSE, SSS and BI (Beta =-0.13, 0.48, 0.52, respectively, p<0.05). BI score was independently predicted by SSS and BBS (Beta= 0.43, 0.54, respectively, p<0.05). BBS score was independently predicted by time since stroke, BI and BADS (Beta= -0.12, 0.80, 0.10, respectively, p<0.05). The total variance in MAS, BI and BBS scores explained by each model was 83%, 85% and 81%, respectively.

Conclusion
ED is independently associated with functional balance performance post-stroke. Clinicians should consider this when developing rehabilitation strategies to improve balance post-stroke.

2018 Difficult cases

**Multiple thrombolysis in Munchausen’s syndrome - a failed attempt at suicide**
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Background - stroke nurses have the task of differentiating stroke from mimics before administering a potentially harmful treatment. This is particularly difficult where patients fabricate symptoms as in Munchausen’s syndrome.

Details of one patient’s recurrent admissions under pseudonyms were obtained from the patient, and verified where possible by contacting other Stroke Units, using personal characteristics - history, tattoo, general appearance, personal effects.

Results - a middle-aged male apparently suffered a left hemiplegia whilst on a train journey, was taken off the train and brought to Watford Emergency Department (ED). He was thrombolysed by a trained ED physician and had a good response. On transfer to the Stroke Unit he was recognised, having presented twice before with an identical history with different names and appearance. On the first occasion he was treated conservatively and on the second refused thrombolysis and discharged himself when challenged. He returned a fourth time directly from another hospital where he had just been thrombolysed and was persuaded to give a full history. He claimed to have been thrombolysed 14 times over an 18 month period following the death of his wife. He wished to die, had survived an overdose, and heard that thrombolysis could be fatal. He had been treated throughout the UK from the north of Scotland to the south coast and from west Wales to East Anglia. He accepted psychiatric referral and a detailed notebook of his career was found amongst his possessions, but he discharged himself within hours. Since then he continues his health-seeking behaviour and has been treated in several neighbouring hospitals.

Conclusions
It has proved difficult both to trace him and to issue warnings to other UK Stroke Units. A national alert system is needed as such a patient, though presumably rare, presents a risk to himself and an abuse of resources. He does however confirm that thrombolysis in functional disorders is remarkably safe.
Upper-limb treatment is a team affair: A non-participant observation study describing upper-limb interventions provided by a team of health care professionals in a case of severe stroke.
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Introduction: The content of routine therapy is poorly described in the literature, especially concerning treatment provided by multidisciplinary teams (MDTs). Differences and similarities in interventions and approaches between team members warrant investigation.

Objectives: a) Describe routine treatment provided by physiotherapy (PT), occupational therapy (OT), speech therapy (ST) and neuropsychology (NP) professionals to encourage upper-limb (UL) integration into functional activity after stroke; b) Identify variability and similarities in UL therapy regarding activities, patient posture, and interaction styles across different disciplines in the context of a case of severe chronic stroke.

Design: Non-participant observation study.
Setting: Ambulatory neurorehabilitation unit in Spain.
Participants: MDT members (PT, OT, ST, NP) delivering rehabilitation in the unit (N=4) and a patient with severe stroke (7 years duration) presenting with right hemiplegia, global aphasia, unilateral neglect and cognitive deficits.
Methods: Twelve routine treatment sessions (3 each for PT, OT, ST, NP) were observed and videotaped; field notes were made. Data were transcribed to a treatment recording tool previously adapted and piloted for this study; content analysis and descriptive statistics were applied to the data.

Results: UL therapy time (minutes of UL activity/total treatment time) ranged from 60-79% across disciplines. PT and OT predominantly used proprioceptive stimulation and attention with hands-on facilitation; ST and NP favoured functional activity involving manipulation and attention with verbal prompting/instructing. Overlap between UL activities occurred between all disciplines, especially between PT and OT and NP and ST. Cognitive interventions prevailed across all disciplines.

Conclusions: A range of similar sensorimotor and cognitive strategies are available to and used by the whole MDT to promote UL integration in individuals with severe clinical presentations.

Figure 1. Bar Charts Displaying the Top Five Most Observed Upper Limb (UL) Activities per Treatment Session, organised by Therapy Professional: Physiotherapist (PT), Occupational Therapist (OT), Speech Therapist (ST), Neuropsychologist (NP).
2020 Difficult cases

Use of the Web 2.0 to share knowledge on complex rehabilitation cases: the experience of the Montreal Stroke Network
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Background: Rehabilitation after a stroke is a complex combination of art and science. Implementing evidence-based practices cannot rely solely on published evidences, it must take into account clinical experience, that is, professionals’ tacit knowledge. Our team developed a web 2.0 platform to facilitate sharing of clinical experience (tacit knowledge) and stroke rehabilitation best practices (explicit knowledge). The platform, launched in November 2010 is used by over 268 members. This paper will specifically report on the strategies and type of knowledge (domain, tacit or explicit) shared by rehabilitation professional to address the rehabilitation of difficult cases. Methods: A content analysis of discussion forums was made based on Wenger’s community of practice model and Nonaka’s knowledge creation model. Results: Members are mostly women (88%), with more than 10 years of experience (59%) and with a high representativeness of occupational therapists (33%) and physical therapists (28%). Overall, 46 health professionals shared tacit and explicit knowledge on topics dealing with the rehabilitation of difficult cases or innovative therapeutic approaches. Knowledge was shared on assessment tools (11 threads), interventions (17 threads) and prevention (2 threads). The two most popular threads on complex issues (more than 20 posts) dealt with the use of Botulinum toxin to treat spasticity and, the screening of driving abilities. Despite available best practices recommendations, sharing of clinical experience was, by far, the strategy most often used by rehabilitation professionals. Complex topics were seldom introduced by clinical cases. Forum moderators were the main contributors of explicit knowledge. Conclusion: Web 2.0 can effectively support professional networks and facilitate knowledge sharing and collaborative practices for optimal management of complex or difficult stroke cases and best practices implementation.
2021 Emergency management, stroke units and complications for nurses

The Effects of a Public Information Media Campaign (FAST) on Presentation and Acute Management of Stroke in an Irish Hospital.
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Background
Stroke is the third most common cause of death and the most common cause of acquired major physical disability in Ireland (1). In people with sudden onset of neurological symptoms a validated tool such as FAST (Face Arm Speech Test) should be used outside the hospital to screen for the diagnosis of stroke or TIA(3). There is considerable evidence supporting the benefits of coordinated stroke care in reducing death and levels of disability for stroke survivors (1). Stroke guidelines cover interventions in the first 48 hours after onset of symptoms and interventions of up to two weeks.

Methods
This retrospective audit was undertaken on all patients who were admitted to Sligo General Hospital with stroke/TIA or stroke mimicking symptoms, six weeks before and after, the official launch of the FAST campaign in Ireland, 6th May 2010 (i.e. between 25th March and 17th June).

A list of audit candidates was compiled by the Stroke Clinical Nurse Specialist’s register of stroke patients and from ward census report data making reference to stroke mimicking events. The data was collected between October 2010 and January 2011 by the Senior House Officer and Intern using a proforma (Appendix 1). Data was analysed by the Clinical Audit Support Team.

Results
- Decrease in time from onset of symptoms to hospital admission
- Decrease in time from onset of symptoms to CT brain
- Increased number of patients: Activation of Stroke Pathway
- Increased number of patients receiving thrombolysis

Conclusion
- Information media has a big influence on Irish society.
- The FAST campaign has shown 50% increase in suspected stroke hospital presentation within the 3 hour window.
- This is also reflected in the 50% increment in the number of patients thrombolysed.
- Information media should be used as a source of conveying healthcare messages.
An 84 year old lady with a history of cardiac disease presented to the Emergency Department 1 hour after sudden onset of speech disturbance and right-sided weakness. She took aspirin 75mg od. There were no known allergies. She lived alone, was independent and did not use cigarettes or alcohol. The Stroke Unit nurse immediately assessed the patient and initiated a remote 2-way audiovisual telemedicine consultation with the Stroke Consultant. The patient had receptive and expressive dysphasia and right-sided sensorimotor deficit (NIHSS 16). Other than BP 173/89mmHg, cardiorespiratory and abdominal examinations were normal. Serum haematology and biochemistry were normal. ECGs showed paroxysmal atrial fibrillation. CT brain showed only small vessel disease. A diagnosis of acute left MCA territory ischaemic stroke was made.

Since the patient was over 80, she was enrolled into the IST-3 trial as per protocol with assent obtained from the next of kin. She was randomised to receive 0.9 mg/kg alteplase and the telemedicine consultation ceased after bolus administration. The patient was transferred to the Stroke Unit and she improved with NIHSS falling to 6. 2 hours later she developed tongue swelling and the Stroke Unit nurse initiated a repeat telemedicine consultation with the Stroke Consultant. There were no other new symptoms but the tongue swelling was significant causing airway compromise. Intravenous hydrocortisone and chlorpheniramine did not improve the swelling but intramuscular adrenaline was then administered to good effect. Repeat CT brain showed left MCA territory subcortical infarction. The patient was provided with long-term anticoagulation and was discharged home after in-patient multi-disciplinary rehabilitation. This case highlights the important role played by stroke nurses for patient assessment and management particularly for neurologic examination, consent, dealing with post-thrombolysis complications and facilitating remote telemedicine consultation.

2023 Emergency management, stroke units and complications for nurses

What is the Evidence? Review of Glycemic Control for Acute Stroke Patients to Promote Multidisciplinary Approach

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Although hospital policy, clinical guideline and text book emphasize the importance of strict glycemic control during an acute stroke phase, in reality nurses often observe patients with glucose level exceeding 300 mg/dl even in a stroke intensive unit. The approach of the glycemic control should be multidisciplinary including nursing care, and nurses can be critical bridge professionals to facilitate effective communication among multidiscipline teams at the point of need. Although considerable research has been devoted to the area of glycemic control in stroke care, nursing care components related to stick glycemic control are poorly organized and outdated. Methods: We conducted systematic review of nursing care related to glycemic control for acute stroke.
Various related key terms were searched using various search engines and databases including Medline, Pubmed, CINAHL, Proquest, and Cochrane. Results: Total 46 articles were reviewed and summarized by the purpose, sample, concepts, design, instruments, outcomes and evidence level with an organized table form. Experts discussed the strategic plans and stroke unit care protocol regarding glycemic control in order to improve multidisciplinary approach of glycemic control for stroke patients. Conclusions: We conducted systematic review of literatures to understand nursing care components related to glycemic control for stroke unit nursing care. Strategic plan including recommended care protocol of stroke unit was designed as an end result to promote multidisciplinary care.

2024 Emergency management, stroke units and complications for nurses

Analysis of the implementation of a validated swallow screening tool for acute stroke: Modified MASA
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Introduction: The Modified Mann Assessment of Swallowing Ability (MMASA) is a tool for screening swallowing difficulties in acute stroke. The MMASA has been previously validated by two Consultant Neurologists with good results (Antonios et al, 2010). The diagnostic accuracy of the MMASA when applied by a multi-professional group of doctors and therapists was evaluated at Frenchay Hospital on an acute stroke unit.

Methods: Patients were screened using the MMASA by a Consultant Physician, Specialist Registrar or Speech and Language Therapists (SLT). Patients were randomly allocated to receive a blind, full clinical examination using the Mann Assessment of Swallowing Ability (MASA), which has previous demonstrated good reliability and validity against the ‘gold standard’ video-fluoroscopy (Mann, 2000). All full clinical assessments were done within 2 hours of screening. Validity between the screening tool (MMASA) and full clinical assessment (MASA) was evaluated for sensitivity, specificity and predictive values.

Results: One hundred stroke patients received both screening and full clinical swallowing examinations. The MMASA was not as robust as previously reported when the outcomes were considered for the multi-professional group at Frenchay Hospital; sensitivity (67%), specificity (85.0%), positive predictive value (79.5%) and negative predictive value (73.8%). However, there was greater safety when the tool was administered by a group of SLT; sensitivity (100%), specificity (67.9%), positive predictive value (73.4%) and negative predictive value (100%). Although implementation of the MMASA was not as robust as previously reported in the literature there was a significant improvement in the incidence of post-stroke pneumonia following multi-disciplinary implementation of screening; 12% post-stroke pneumonia rate 2008 and 3% post-stroke pneumonia rate 2010.

Conclusions: The results of this study in-
dicate that the MMASA swallow screening tool, when implemented in a United Kingdom teaching hospital by a multi-professional group may be less vigorous than previously reported, but there was a positive impact on the incidence of post-stroke pneumonia.

**2025 Physiotherapy and early rehabilitation including intensive care and artificial respiration**

**Factors related to mobility and physical activity in individuals one to three years after stroke.**

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**Purpose**
The aims of this study were to explore physical and psychosocial status one to three years after stroke and to investigate their impact on physical activity, measured with Physical Activity Scale for the Elderly and mobility i.e physical function in lower extremities measured with Short Physical Performance Battery.

**Methods**
A cross-sectional study conducted in Sweden, including community living individuals, 65-85 years old. Performance-based physical function; motor impairments, mobility and self-reported psychosocial factors; health related quality of life (HRQoL), fall-related self-efficacy, depression, cognition, fear of falling (FOF), falls previous year and physical activity were assessed.

**Results**
Two-hundred individuals (69 % men, mean-age 74 years) participated. Present were possible depressions and high prevalence of falls previous year. Fear of falling were more common in women than in men. Mobility was slightly affected and walking speed was slow. Level of physical activity was low (mean-score 95.5 p). Comorbidity was seen in 41 %. Separate multiple regression models predicting physical activity and mobility scores described 29 % and 56 % of the variance in each outcome (total adjusted R\(^2\)). Mobility (p<0,001) and motor impairment and HRQoL, (p=0,02) were positively associated with physical activity.

**Conclusions**
Our study showed that individuals 1-3 years after stroke suffered from several preventable disabilities. Aspects such as self-efficacy, HRQoL, depressions, FOF, falls, cognition, motor impairments, age, and comorbidity should be considered in rehabilitation in late stroke aiming to increase level of physical activity and mobility.
Physiotherapy and early rehabilitation including intensive care and artificial respiration

Occupational therapy in acute stroke at the department of vascular neurology in Ljubljana

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Background
Early rehabilitation improves functional outcome and quality of life for stroke patients. Occupational therapy (OT) aims to remediate sensory, motor, perceptual and partly cognitive impairment, minimizes secondary complication, improves performance of meaningful tasks and participation, provides education of patients’ important others. However, there is a short tradition of OT in acute stroke at the Clinical department of vascular neurology in Ljubljana. We therefore investigated the availability and content of OT in year 2011.

Methods
All patients with acute stroke, referred by the neurologists’ to two ward occupational therapists, were recorded. We were looking at the number of patients receiving an OT, the length of OT intervention and the content of OT intervention. Content of OT were explored in terms of activity of daily living (ADL) training, impairment treatment (mainly upper extremity training), minimising secondary complications by introducing adequate positioning in the bed and during all activities and education of their relatives.

Results
There were 1819 stroke patients admitted to the hospital and 572 (31%) patients were referred into OT. The average length of OT intervention was 17 days (range 1-22). In total, there were 2795 OT treatment sessions. Treatment sessions were combined of ADL training 2655 (95%), 2655 (95%) impairment training, adequate positioning 2795 (100%) and education 419 (15%).

Conclusion
Availability of OT to acute stroke patients is limited. The content of OT intervention mainly consists of minimizing secondary complications, ADL training, impairment training and to some degree also education of relatives.

2027 Stroke care problems

RECOVERY EXPECTATIONS DEVELOPED IN THE ACUTE SETTING HAVE AN ONGOING AND LASTING IMPACT ON ADJUSTMENT TO LIFE AFTER STROKE
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Background
Stroke has a lasting and profound effect on the lives of stroke survivors; for many the full impact of adjusting to life only becomes a reality on returning home. In the UK there is an increasing focus on life beyond the hospital phase and guidance recommends stroke survivors’ needs are reviewed at six months post discharge. The aim of this study was to explore how stroke survivors, six months post discharge and beyond, were managing in the community.

Method
Ten community dwelling stroke survivors were recruited through two third sector organisations. Semi-structured interviews were used to generate data, transcribed verbatim and thematically analysed. Ethics approval was granted.

Results
Findings revealed a common frustration expressed in terms of ‘not yet being back to normal’. This discontent appeared to be underpinned by unmet recovery expectations formulated during the acute stage from answers given by health professionals to questions about recovery. Responses to questions like ‘Will I walk again’ seemed to have a lasting impact on adjustment and coming to terms with life after stroke; stroke survivors perceived recovery as a return to their pre-stroke lives. Differing definitions of recovery, along with a paucity of information about what recovery to expect compounded feelings of loss, uncertainty and fear once back in the community. Insufficient therapy provision was described as an obstacle to achieving recovery.

Conclusions
Longer term concepts of recovery appear to be influenced by messages articulated in hospital. Findings highlight the challenge for stroke teams to balance providing realistic information regarding recovery expectations with maintaining hope for the future. Acute stroke teams have little contact with people after discharge, thus they are not exposed to the unintentional implications of the messages they give. Stroke survivors could be involved in training.
Diagnostic accuracy of an ultrasound method of glenohumeral subluxation in patients with post-stroke hemiplegia

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Background: Stroke is one of the most common causes of disability in the western world. Glenohumeral subluxation (GHS) is a common post-stroke complication reported in up to 81% of patients and has been associated with poor upper limb recovery. Treatment of GHS is however compromised by a lack of reliable, objective, real-time measurements. The aim of this study was to determine the diagnostic accuracy of an ultrasound method of GHS assessment against a reference criterion clinical method (fingerbreadth palpation).

Methods: Patients (n=105) with first time stroke with one-sided weakness, who gave informed consent, were recruited. Ultrasonographic measurements of acromion-greater tuberosity distance were used for the assessment of GHS. The Measurements were undertaken on both shoulders by a physiotherapist trained in shoulder ultrasound with patient seated in a standardised position. Clinical assessment of GHS was undertaken by a clinical physiotherapist. Diagnostic accuracy of the ultrasound method was tested against the clinical method diagnostic criterion using the Receiver Operating Characteristic (ROC) curve, the area under the ROC curve (AUC), sensitivity, and specificity.

Results: Mean age of patients was 71+-/11 years and the median time since onset of stroke was 5.6 weeks. The AUC was 0.73 (95% confidence interval 0.63-0.83) suggesting that the ultrasound method has good diagnostic accuracy when compared with the clinical method. A cut-off point of >0.2cm AGT measurement difference between affected and unaffected shoulders generated a sensitivity of 68% (95% confidence interval 51%-75%) and a specificity of 62% (95% confidence interval 47%-80%).

Conclusion: These findings suggest that programmes to help staff learn to better address these important areas.
the ultrasound method has the potential to address the current limitations of the clinical method which can only detect gross changes of >0.5cm. Given its precision, the ultrasound method could be used as an outcome measure to evaluate the effectiveness of treatment interventions for GHS.

Figure 1: Receiver Operating Curves (ROC) for ultrasound method of assessment of GHS against the palpation method criterion

2029 Stroke care problems

Outcome after stroke: feasibility of outcome assessment by phone
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Introduction
Acute and secondary prevention treatment strategies are usually implemented in clinics after proven beneficial effects on outcome after stroke, based on the results of large randomized clinical trials. Compliance of secondary prevention, the hallmark of these trials is known to be poor. Therefore, the results may not always be that generalizable.

Long term outcome measures are not being collected routinely in most stroke centers once a therapeutic strategy has been implemented. To do so would be of utmost importance to verify the effect of proven therapeutic strategies outside a trial, and would result in data to be used for benchmark. We therefore wanted to assess the 1-year outcome after stroke by telephone, including indicators of the stroke care process.

Methods
Study population
All patients with a ischemic stroke who were admitted to the neurological department of the Radboud University Nijmegen medical Centre, the Netherlands, from June till November 2010 were contacted one year after their stroke by telephone with a structured questionnaire on process indicators (iv thrombolysis, door-to-needle time, compliance) and outcomes (incident cardiac or neurological events, mRS)

Results:
Of the 117 patient 10 patients were lost for follow-up but did not died. 6 patients (5%) died within 1 year. 101 patient were interviewed by telephone. Mean age was 66 year and 52% were female. 98% still used anti-platelets and 95% statins. The cumulative incidence of stroke and myocardial infarction was 6.5% and 1.9%. 84% of all patients had a Rankin <2 score

Conclusion: The development and application of a short post-stroke outcome assessment screening tool is feasible and can
potentially be used to get information about compliance and long term outcomes.

2030 Stroke care problems

Prediction Model for Burden of Stroke Caregivers Applying Data Mining Technique
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[Background] Stroke suddenly occurs and most families experience anxiety about uncertainty, emotional distress, and challenges. Researchers report more than half of family members of stroke survivors are dissatisfied with routine discharge planning in hospitals. In practice, little information is provided to family caregivers of stroke patients. Experienced clinicians often foresee the stress and frustration of family members and are concerned about that current routine discharge care plan does not properly prepare them. Understanding burden of stroke caregivers is necessary for clinicians to overcome shortcomings of current routine discharge plan. The purpose of this study is to investigate burden of stroke caregivers. [Methods] We conducted data mining of the Behavioral Risk Factor Surveillance System (BRFSS) in order to examine burden of stroke caregivers. The most available data of stroke caregivers were extracted from BRFSS, and were investigated to examine caregiver difficulties, and predictors of stress among stroke caregivers, potential target population for emotional support upon hospital discharge. Various classification data mining techniques were applied to identify predictors of stress among stroke caregivers using WEKA 3.7.1 data mining software. [Results] Age, education level, smoking status, patient status change, veteran, and asthma status were identified as predictors of stress among stroke caregivers. Experienced stroke nurses identified nursing implications and strategies to improve routine discharge care plan and appropriate actions. [Conclusion] Application of data mining techniques supported identification of burden of stroke caregivers and appropriate actions as well as the target population most in need of caregiver support. Nursing care strategies such as educational materials or introducing peer caregiver support group have the potential to improve discharge care planning for stroke survivors and promote appropriate care actions.

2031 Stroke care problems

Post Stroke Culturally-Sensitive Care Needs: Comparison of functioning and Disability and Contextual Factors Among Hispanic and Non-Hispanic Urban Dwellers
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[Background] Most stroke patients often have various long-term outcomes according to their different ethical backgrounds. In fact, U.S. national guideline recommends that clinical stroke management include longer-term recovery plans providing community-based care programs including self-
management programs, support groups, and counseling. Further, hospital discharge policy requires providing culturally-sensitive contextualized education. The predominant ethnic group served by our medical center, are Hispanics. The purpose of the study is to investigate stroke care needs of urban Hispanics to support the clinical care process. [Methods] Data of urban post-stroke individuals in the U.S. (n= 6289) were extracted from the Behavioral Risk Factor Surveillance System (BRFSS) to identify stroke care needs of Urban Hispanic group. Health domains of WHO’s framework, International Classification of Functioning (ICF) were examined among non-Hispanics and Hispanics living in urban area. PASW STATISTICS 18 was used for data analysis. [Results] Descriptive statistics of ICF health domains including personal factors, social factors, body functions and activities were visualized. We found disparities between Hispanics and non-Hispanics. In contextual factors, Hispanics had higher rate of diabetes (36 % vs 30%), depression (31% vs 27%), yet lower in social support (60% vs 70%). In a functioning and disability factors, fall and injury rate was higher (58% vs 45%). Further, nursing diagnosis and care strategies were discussed by experienced nurses based on this evidence to help them for reintegration into community. [Conclusion] Care needs of Hispanic stroke survivors dwelling urban area were identified and compared to non-Hispanic urban stroke survivors. This finding may help nurses to provide contextualized culturally-sensitive education for Hispanic stroke patients. Further, this concrete and clear evidence from recent data may promote clinicians to adhere national guideline.

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Use of nasal bridle tubes in stroke patients requiring naso-gastric feeding
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Background
The objective was to demonstrate how the use of a nasal bridle retaining system could assist in the treatment of stroke patients helping to prevent the removal of naso-gastric tubes (NGT), reduce incidents of NGT replacement, improved delivery of feeds and reduce costs.

Methods
Nasal bridle tubes were trialled on 3 stroke patients on the stroke ward: patients A, B & C. Patient A was consuming minimal amounts orally and had a nasal bridle tube placed following removal of three NGT. Patient B was consuming a minimal oral intake secondary to drowsiness and had removed five NGT. A nasal bridle was placed to secure the NGT. Patient C was fasting secondary to dysphagia. Several NGTs’ were removed by the patient. A nasal bridle was placed facilitating 11 days feeding.

Results
Patient A received feed for 22 days via an NGT. After this time the NGT became dislodged. Patient A was discharged managing small amounts of a high calorie high protein diet orally. Patient B removed the NGT 24 hrs post placement of the nasal bridle. No damage occurred to the septum. The patient was discharged on modified
Skin integrity is a problem for stroke patients. Inability, paralysis, depressed level of consciousness, bladder and fecal incontinence are the main reasons for skin breakdown. Nursing staff should be attentive to patients and assess their skin in order to prevent pressure ulcers (PU). Our aim was to evaluate the prevalence, the influence upon outcomes and predictors of in-hospital PU in patients with ischemic stroke (IS).

Methods: Retrospective analysis of prospectively collected data of patients admitted to a tertiary hospital with IS. Our hospital is certified by the Joint Commission International as a Primary Stroke Center. The presence of PU was obtained from a review of nursing records. Modified Rankin scale (mRs) at discharge was evaluated.

Results: A total of 300 patients (mean age 72.6±15.23 yo, 57.6% males) were evaluated from Jan 2010 to Dec 2011 of which 47 (15.6%) had PU. The mean NIHSS at admission was 7.35±7.68 and mean length of stay was 21.80±46.85 days. Patients who had PU had higher NIHSS [13.47±8.67 X 6.39±7.06, p<0.01], were older [80.89±10.78 yo X 71.06±15.45 yo, p<0.01] and had a longer length of stay [51.94±72.72 days X 16.20±37.92 days, p<0.01] than patient who did not have PU. Patients with PU had a trend towards a higher frequency of diabetes (p=0.12). Patients who did not have PU had a better outcome at discharge (mRs ≤2)[74.3% X 29.8%, p<0.01] and had lower mortality rates [34.0% X 7.9%, p<0.01]. In a multivariate logistic regression analysis, age (OR=1.08 CI 95%[1.03-1.13], p<0.001), NIHSS (OR=1.08 CI 95%[1.02-1.12], p<0.01) and length of stay (OR=1.0 CI 95%[1.00-1.01], p=0.023) were indepen-
dents predictors for PU. Conclusion: PU was not uncommon in patients admitted with ischemic stroke, even in a certified Primary Stroke Center. Age, length of stay and stroke severity were independent predictors of PU in our series. Therefore, one should pay careful attention in older patients with more severe strokes and long hospital stay in order to prevent such complication.
Thursday 24 May 2012
E-Poster Session Blue

Chairs:
M. Fatar, Germany, V. Hömberg, Germany, J.P. Mohr, USA, K. Szabo, Germany

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Acute stroke: current treatment ---p.512
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Acute cerebrovascular events (ACE): TIA and minor strokes ---p.520
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Small vessel stroke and white matter disease ---p.535
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Stroke after non-cardiac and non-carotid invasive procedure
Perioperative stroke-data in the Ludwigshafen Stroke Study (LuSSt)

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Background: Perioperative stroke is a serious complication leading to a devastating outcome with high rates for mortality and morbidity. While stroke in cardiac and certain vascular surgeries has been well studied, less is known about stroke risk in non-cardiac or non-neurosurgical surgeries. We here report on two-year data from a prospective population-based stroke register.

Methods: The Ludwigshafen Stroke Study (LuSSt) is a prospective ongoing population-based stroke register among the 167906 inhabitants of Ludwigshafen a. Rh. Starting on January 1, 2006, standard definitions and multiple overlapping methods of case ascertainment were used to identify all patients with incident stroke or transient ischemic attack. All patients who suffered cerebrovascular events following the next 12 months after surgical or invasive intervention were included for present analysis.

Results: In 2006 and 2007, 1231 cases with stroke or transient ischemic attack were registered. 125 (10.2%, mean age 71.7 years) patients reported on non-cardiac or non-carotid invasive intervention. 34 (27.2%) of those patients (including 24 cases (70.6%) of first-ever strokes) suffered their stroke within the first 30 days after an invasive procedure (p= < 0.01) and 45 (36.0%) patients within 60 days. There was no influence of stroke etiology and stroke risk factors on occurrence of stroke after invasive procedure.

Conclusion: Stroke in cardiac or carotid surgeries is a well described complication. However, we found a high incidence of 125 cases (10.2%) of a group with non-cardiac and non-carotid invasive procedures within twelve months. Risk of stroke is highest within the first days after an invasive procedure and decreases further on (figure 1). Missing influence of age, stroke classification, etiology or classical risk factors hypothesize other mechanisms for stroke.
and compare different diet components with healthy controls.

Methods: Prospective case-control study. A previously validated nutritional survey was administered to patients or their relatives and controls. Anthropometric data, vascular risk factors, caloric intake and diet nutrients were evaluated. Intention to follow a healthy diet was also assessed in both groups.

Results: 300 AIS/324 controls without differences in anthropometric data or vascular risk factors, except diabetes and ischemic heart disease. There was a higher caloric intake in stroke patients (2652.5±726.7 vs 2306.9±1535.2 Kcal, p=0.001). After adjusting for energy intake, AIS patients had higher intake of proteins (p<0.001;OR 1.02) total cholesterol (p=0.008;OR 1.004) and breaded food (p=0.009;OR 1.19) and lower consumption of monounsaturated fat (p=0.01;OR 0.9) and bifidus (p=0.005;OR 0.88).

Control participants have more intention to follow healthy habits. They showed higher intention to eat vegetables (p=0.002;OR 1.5) and whole foods (p=0.000;OR 2.4) and to reduce salt intake (p=0.002;OR 1.7), fat (p=0.000;OR 3.7) and sweets (p=0.004;OR 1.7) than AIS patients.

Conclusion: We observed different dietary patterns among AIS patients and controls. AIS patients have a higher caloric intake and are less concerned about maintaining healthy nutritional habits.
Variation between ethnic groups in ischaemic stroke subtypes? - systematic review of population-based studies

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Background and aims: We aimed systematically to evaluate the evidence for variation between ethnic groups in incidence and relative frequencies of ischaemic stroke (IS) subtypes. If real, such variation could provide insights into the genetic and environmental determinants of IS subtypes.

Methods: We comprehensively sought worldwide, population-based studies of incident strokes, with data on ischaemic stroke subtypes (TOAST or Oxfordshire Community Stroke Project classification systems) by ethnic group, published since 1990. We compared age-adjusted incidence and proportions of ischaemic stroke subtypes between ethnic groups and geographic locations. For TOAST subtypes, we assessed the correlation between the numbers of IS of undetermined versus each determined aetiology, using linear regression.

Results: We included 16 studies in Black, White, Japanese, Hispanic, Pacific Asian and Maori populations from Europe, USA, West Indies, Japan, Australia and New Zealand. Most used the TOAST classification system. The percentage of ischaemic stroke subtypes varied widely between different ethnicities in the same and different geographic locations (lacunar 11 to 54%, atherothrombotic 2 to 36%, cardioembolic 15 to 36%, other determined <1 to 4%) but the most common and widely varying subtype was ischaemic stroke of undetermined type (0 to 61%). Diagnostic work-up also varied widely. We found a significant negative correlation between numbers of undetermined IS and each of lacunar IS (r = -0.92, 95% CI -0.97 to -0.80) and atherothrombotic IS (r = -0.71, 95% CI -0.88 to -0.39).

Discussion: Substantial variation in the proportion of undetermined IS subtype was probably due to differences in diagnostic work-up and/or interpretation of TOAST criteria, and influenced variation in the proportions of lacunar and atherothrombotic IS, precluding reliable detection of any true ethnic differences.

Increased rate of first ever ischemic stroke in areas with low level of education is not associated with higher incidence of carotid stenosis – a study from Western Sweden (WINGA)

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Background: Socioeconomic status is associated with incidence of ischemic stroke (IS). The relation to carotid artery
stenosis is not well studied. This study tested if stroke rate is affected by level of education and if this can be explained by increased frequency of carotid artery stenosis.

Methods: The WINGA registry contains records of all patients referred for carotid evaluation in the city of Gothenburg (2004-2008). First-line carotid examination is according to local guidelines exclusively done with ultrasound and the registry covers 96% of all carotid examinations in the city (population of 500 181). Patients with first ever IS or TIA were included, atrial fibrillation or treatment with anticoagulants excluded. National census data on average level of education were used to divide the city in tertiles of high, medium and low education.

Results: The study population (n=1899, 53% male) consisted of 1364 IS and 535 TIA cases examined with carotid ultrasound in the city of Gothenburg. In our population, level of education was inversely proportional to age-adjusted standardized incidence rate of IS (5.14, 6.08, 7.87 cases/10 000/year, P<0.0001) but no relation to TIA was found (2.49, 2.51, 2.55, NS). Multivariate analysis with IS/TIA as dependent showed four factors independently associated with risk of suffering IS instead of TIA: level of education (OR 1.21, CI 1.05-1.40) male sex (OR 1.44, CI 1.15-1.40), systolic blood pressure (OR 1.01, CI 1.006-1.016) and presence of carotid stenosis >50% (OR 1.80, CI 1.28-2.53). However, the incidence of carotid stenosis (16%) was not associated with level of education (p=0.498).

Conclusion: The data suggest that in areas with low level of education the patients more often present with stroke than TIA. Carotid stenosis is associated with stroke but not with education. Primary prevention strategies in these areas should inform about TIA symptoms and the importance to seek urgent medical attention to reduce the risk of stroke.

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Relationship Of Insular Stroke On Newly Detected Atrial Fibrillation And MRproANP Levels
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Background: Insular damage in isch-
Emic strokes has been associated with new onset of atrial fibrillation (AF). In this study, we sought to assess the relationship of insular strokes (IS) on with newly detected AF and MR-proANP levels, a sensitive biomarker for AF. Patients and methods. This study is based on a prospective cohort of patients with an acute cerebrovascular event at the University Hospital Basel, Switzerland. Patients fulfilling the following criteria were evaluated: (1) diagnosis of acute ischemic stroke (2) No previous stroke in the past medical history and on MRI (3) No history of AF (4) No lesion size > 20 ml on DWI. Blood samples were collected on admission, to assess levels of MRproANP. New onset AF was detected on 24-hour electrocardiography and/or echocardiography. Involvement of the insular cortex as well as lesion volume was assessed by consensus of two experienced raters unaware of the clinical and laboratory findings. Results: 84 patients fulfilled the above-mentioned criteria, 10% (8/84) suffered from IS and 10% (8/84) were newly diagnosed with AF. Involvement of the insula was associated with 8.5-fold higher odds of newly diagnosed AF. These findings were independent of stroke severity (NIHSS), blood pressure & heart rate on admission or history of arterial hypertension and cardiovascular disease. Admission MR-proANP levels were 195.5 pmol/l in patients with new onset of AF compared to 92 pmol/l in patients without no new onset of AF (p<0.01). However, no differences in MR-proANP levels were seen between patients with or without IS. Conclusion: This analysis shows that small ischemic strokes restricted to the insular cortex are highly and independently associated with AF in the acute hospitalization period. Higher levels of MRproANP where also associated with AF though the increase in MRproANP seems not to be associated with IS. If externally validated, both elevated MRproANP and IS may indicate the need for more extensive cardiac monitoring.

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The First 100 Thrombolysis Cases in a Novel Scottish MESH Telestroke System.
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Background
Stroke thrombolysis has been a major driver for change within stroke services. However, up until recently its widespread application has been limited to tertiary centres. Transfer to tertiary care can lead to significant delays in thrombolysis. We rolled out a novel (in Scotland) MESH telestroke network which, instead of a hub and spoke model, allows one of a number of stroke specialists to make videoconference-based thrombolysis decisions either from one of three stroke units or from home. We wish to report data on the first 100 patients treat-
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Quality of in-hospital care and stroke units volume. Results from the Lombardia Stroke Registry (LSR).

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Background – The association between hospital volume and the outcome in patients who are hospitalized for acute ischemic stroke remains unclear. The aim of our study was to assess the impact of the Stroke Unit (SU) case-load on the quality of care, death rate and disability.

Methods - 5206 ischemic stroke patients were using this model.

Methods
Retrospective review of the first 100 strokes thrombolysed with tissue plasminogen activator (t-PA) across 3 stroke units between the period of September 2008 and October 2011. Data was extracted from the Stroke Audit In Lanarkshire database and casenotes retrieved for further clarification.

Results
Median age was 73 (IQR 63-80) and median admission NIHSS was 12 (IQR 7-18). 50% of cases were assessed by Telestroke link. Median symptom onset to presentation time was 64 minutes (IQR 45-87). Median “door-to-CT” and “door-to-needle” times were 41 minutes (IQR 28-69) and 88 minutes (IQR 66-116) respectively. Overall, median symptom onset to treatment time was 160 minutes (IQR 125-190), comparable to analysis of UK data from SITS-ISTR (155 min, IQR 130–170). Symptomatic intracerebral haemorrhage (as per SITS-MOST definition) occurred in 2%.

Conclusions
Our experience of t-PA is comparable to UK data extracted from SITS-ISTR in overall timings and complication rates. The breakdown of times from presentation to treatment are slower than SITS- Europe data, indicating scope for improving access to early CT scans. However, it is clear that telemedicine can overcome infrastructure challenges to permit safe thrombolysis with similar results to other UK centres. This model could be replicated to provide thrombolysis services to areas with insufficient stroke specialist cover.
participating in the LSR have been evaluated. The adherence to 12 evidence-based performances measures (PM) of the process of care has been calculated. We identified the cut-off of case-load > 300 patients/year as target and applied the multiple logistic regressions, corrected for age, sex, pre-stroke disability and stroke severity, to verify the impact of case-load on mortality, disability and PMs.

Results – In univariate analysis a case-load > 300 patients/year was correlated with a higher probability to have organised stroke care (p<0.01), rehabilitation within 48 hour (p<0.01), antithrombotic therapy within 24 hours (p<0.01), intra (p<0.05) and extra-cranial (p<0.01) vessel evaluation and with a lower risk of medical and neurological complications during hospitalisation. In multivariate analysis a case-load >=300 patients was an independent predictor of a modified Rankin scale score <2 at discharge (OR: 1.40, 95%CI: 1.24-1.62, p<0.001), at 3 months follow-up (OR: 1.36, 95%CI: 1.00-1.85, p<0.001), and to be alive at 3 months follow-up (OR: 1.73, 95%CI: 1.18-2.53, p<0.001).

Conclusions – Our data show a general positive relationship between the quality of care and the SU case-load. A larger practice size leads to improve the quality of care with a positive influence on stroke outcomes but it is essential that hospital resources are accurately weighed on the hospital volume to enable the optimization of the stroke care.
ing an ABCDE approach

Methods:
A computer-generated list of all patients in the CSC who received an initial assessment by the stroke team in January 2011 was used to identify those who had been admitted on the stroke emergency pathway and received a pre-hospital paramedic assessment.

Results:
81 out of 95 patients (85.3%) fulfilled all criteria for transfer to the CSC. Of the 14 patients (14.7%) who did not fulfill all criteria:
5 (5.3%) were FAST negative
7 (7.4%) were brought to the CSC more than four hours from onset of symptoms
1 (1.1%) was physiologically unstable with a GCS of less than 9, bypassing their local hospital.
1 patient (1.1%) was brought to the CSC within working hours, bypassing their local thrombolysis centre.

Conclusion:
This protocol was followed correctly in most cases. In one case, a physiologically unstable patient bypassed their local hospital; no patients with untreated hypoglycaemia were identified at the CSC. We support an ongoing programme of training and education for paramedics involved in pre-hospital assessment of FAST positive patients.

Final Diagnosis of Patients on Stroke Emergency Pathway (n = 95)

- A: Airway must be patent
- B: Respiratory rate must be less than 30 breaths per minute and saturations must be 90% or greater, with or without oxygen
- C: Pulse must be greater than 40 and less than 120, and blood pressure greater than 90/60.
- D: GCS must be 9 or above
- E: BM must be checked, and corrected if less than 4.

ABCDE assessment of physiological stability

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PREDICTORS OF ACUTE POST-STROKE INFECTIONS IN PATIENTS ADMITTED TO A STROKE UNIT
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Background: Acute ischemic stroke (IS) can be complicated with a variety of infectious. Although some factors have been associated with the development of infections, few studies explored possible protective factors of infection in IS. Our goal is to identify the clinical and laboratory factors that may be related with high and low risk of infection in patients with acute IS admitted to a SU.

Methods: Observational study. Inclusion of consecutive patients with IS from 2006 to 2010. We analysed demographic data, vascular risk factors, pre-stroke treatments, stroke severity and haematological and biochemical findings associated with the development of infectious complications such as pneumonia, urinary tract infection and sepsis. A multivariate analysis to identify the clinical and laboratory factors independently associated with risk of infection was performed.

Results: 1395 patients were included. 132 patients developed infections during hospital stay: pneumonia 109 (7.8 %), urinary tract infection 30 (2.2 %) and sepsis 30 (2.2 %). Stroke severity at admission (NIHSS >7) (OR 1.2; 95 % IC 1.1-1.3), worse pre-stroke functional state (mRS >2) (OR 1; 95 % IC 1.2-3.3) and length of stay (1.04; 95 % IC 1,002-1,078) were independent factors related with high risk of infection. On the other hand, higher HDL-cholesterol levels (OR 0.9; 95 % IC 0.8-0.9) were independently associated with less risk of infection.

Conclusions: The worst pre-stroke functional state and stroke severity at admission were associated with high risk of infection whilst high HDL-cholesterol levels were an independent factor of less risk of infection in acute IS.

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No thrombolysis service? No worries. A controlled trial of facilitated access for rural stroke patients to a regional thrombolysis centre - The Hunter Rural PAST Protocol

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Background Access to stroke thrombolysis for rural populations in Australia remains very limited. In metropolitan regions Pre-hospital Acute Stroke Triage (PAST) protocols dramatically improved access(1) however, there have been no rural trials. We developed and tested a rural PAST protocol(2) to facilitate rural
community access to thrombolysis. It requires strong, effective collaboration between ambulance and hospital services.


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Organised inpatient (stroke unit) care for stroke.

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Background: Organised stroke unit care is provided by multidisciplinary teams that exclusively manage stroke patients in dedicated stroke wards (acute, rehabilitation, comprehensive), with a mobile stroke team or within a generic disability service (mixed rehabilitation ward). We updated the Cochrane systematic review to compare stroke unit care with alternative forms of care.

Methods: We searched MEDLINE, EMBASE, CINAHL, the Cochrane Stroke Group trials register, international ongoing trials registers, reference lists of articles and performed citation searching. Foreign language translations were sought when required. Two review authors assessed trial quality and eligibility and performed data extraction. We used fixed effect models to estimate odds ra-
Results: We identified a further 15 trials, of which 3 were excluded and 7 are pending further information. In total, thirty six trials (7981 patients) were included in this review. Compared with alternative services, stroke unit care showed reductions in the odds of death recorded at final (median one year) follow-up (odds ratio 0.80; 95% CI 0.71-0.90; P=0.0001), death or institutionalised care (0.81; 0.74-0.90; P<0.0001) and death or dependency (0.75; 0.68-0.83; P<0.00001). In sensitivity analyses the observed benefits remained when analysis was restricted to trials using formal randomisation procedures and blinded outcome assessment. Stroke unit benefits were independent of patient age, sex and stroke severity but appeared to be greater in units based in a discrete ward. There was no indication of increased hospital stay under organised stroke unit care.

Conclusions: Stroke patients who receive organised inpatient care in a stroke unit are more likely to be alive, independent, and living at home one year after the stroke. The benefits were most apparent in units based in a discrete ward.

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Time is brain(stem) in basilar artery occlusion
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BASICS Study Group

Background. In patients with acute ischaemic stroke in the anterior circulation, recanalisation therapy is associated with improved functional outcomes. The earlier recanalisation therapy is started, the more benefit can be expected. It remains unknown if the time-is-brain concept also holds true for ischaemic strokes in the posterior circulation. Using data from the BASICS registry, we investigated the relationship between time-to-treatment and functional outcome in patients with basilar artery occlusion (BAO).

Methods. We included patients with BAO who received IVT or any intra-arterial treatment (IAT: either intra-arterial thrombolysis, mechanical clot disruption, or both). Patients receiving no treatment and those who were treated with platelet aggregation inhibitors only were excluded. Time-to-treatment was defined as the time between symptom-onset and start of recanalization therapy. Poor functional outcome (modified Rankin scale score 4-6) after one month was compared between four groups, based on time-to-treatment: <=3 hours, >3 to <=6 hours, >6 to <=9 hours, and >9 hours. Risk ratios with 95% confidence intervals were calculated, with the <=3 hours group as
Treatment with GP-IIb/IIIa-antagonist (Tirofiban) in intra-arterial thrombolysis is associated with increased risk of fatal intracerebral hemorrhage

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Background: We aimed to investigate a putative relationship between intracerebral hemorrhage (ICH) following endovascular treatment in relation to additional treatment with the GP-IIb/IIIa antagonists Tirofiban.

Methods: Data of 151 consecutive patients with acute ischemic stroke due to large artery occlusion and treated either with intra-arterial (ia) or intravenous (iv)/ia thrombolysis during the years 2008-2011 were analyzed. Clinical characteristics, treatment and time intervals as well as radiological data were prospectively collected. Clinical outcome after 3 month was assessed using the modified Rankin Scale (mRS). Patients with ischemic strokes in the posterior circulation were excluded from further analysis (n=26).

Results: Of 125 patients with anterior circulation strokes underwent endovascular treatment 29 patients additionally received Tirofiban. Baseline characteristics: mean age 67.9 years, 56.8% female, median NIHSS 19 and median time to
treatment of 120 min were without any differences between the two groups. Good 3-months outcome (mRS 0-2) was observed in 10.4% of patients treated with and in 20.8% treated without Tirofiban (p=0.2). Overall incidence of ICH was 16 (55.2%) in the group treated with Tirofiban and 52 (55.9%, p=0.97) treated without Tirofiban but fatal ICH occurred more frequent in patient underwent Tirofiban co-treatment (13.8 % vs. 3.1%, p=0.03). Multivariable stepwise regression model found treatment with Tirofiban independently associated with fatal ICH (OR 8.7, 95% CI 1.5-49.6, p=0.01), adjusted for age, NIHSS, time to treatment, ia vs. iv/ia thrombolysis and stenting.

Conclusion: In patients received ia or iv/ia thrombolysis due to large vessel occlusion, good outcome is rare, while rate of ICH is high. With regard to fatal ICH we observed a higher incidence in patients treated with GP-IIb/IIIa in univariate and multivariate analysis.

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Prediction of candidates for rescue reperfusion therapy during thrombolysis: comparison between baseline clinical stroke subtypes and multiparametric MRI

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Background and Purpose. Information about the presence of treatable target vessel occlusion (TVO) and/or ischemic penumbra based on stroke MRI is useful in decision-making regarding rescue reperfusion therapy. The aim of this study was to document the MRI parameters corresponding with clinical stroke subtypes with the hypothesis that the persistence of TVO and ischemic penumbra may be distinctive between the clinical stroke subtypes. Methods. A total of 163 patients with acute ischemic stroke in the anterior circulation were included in this study. All of the patients were treated with intravenous alteplase, and MRI scans were performed following alteplase initiation. Prior to treatment, the patients were categorized, based on the Oxfordshire Community Stroke Project (OCSP) classification scheme, as having total anterior circulation infarcts (TACI), partial anterior circulation infarcts (PACI), or lacunar infarcts (LACI). The relationships between OCSP subtypes, MRI parameters, and clinical variables were analyzed. Results. Persistent TVO despite alteplase infusion was found in 85/163 patients (52%): 54/67 TACIs (77%), 19/36 PACIs (49%), and 12/60 LACIs (19%). Diffusion-perfusion mismatch was found in a total of 71 patients and more specifically in 40 of 67 TACI
patients, 21 of 36 PACI patients, and 10 of 60 LACI patients. By multinomial regression analysis, TVO was significantly more prevalent in the TACI (odds ratio, 16.615, p=0.000) and PACI (odds ratio, 4.471; p=0.001) than in LACI. Conclusions. In this study, we found that the clinical stroke subtypes TACI and PACI may be predictive of angiographic occlusions and the presence of ischemic penumbra, which in turn could identify candidates for reperfusion therapy.

Introduction & Objective: Ultra-early carotid and transcranial Duplex ultrasound allows urgent identification of tandem extracranial internal carotid artery (ICA) / middle cerebral artery (MCA) occlusion in acute ischemic stroke patients. Moreover, carotid Duplex allows discrimination between cardioembolic (CE) and atherothrombotic (AT) ICA occlusions. We aimed to compare baseline characteristics and response to intravenous thrombolysis in patients with acute tandem ICA/MCA occlusions of CE vs. AT origin.

Method: We studied consecutive acute non-lacunar middle cerebral artery (MCA) ischemic stroke patients treated with i.v. thrombolysis who underwent extracranial ultrasound imaging and transcranial Duplex right before tPA infusion. Only patients with cervical ICA-MCA tandem occlusion were included. CE-ICA occlusions were defined by the presence of mobile iso-hyperechogenic material in the arterial lumen with absence of significant atheromatosis. Clinical and demographic baseline variables were recorded. Poor long-term functional outcome (day 90-modified Rankin scale score >2) and mortality were compared between both groups.

Results: Between January 2008 and February 2011, 273 patients with ischemic stroke were treated with intravenous thrombolysis. Early neurosonology exam identified ICA-MCA tandem occlusion in 27 patients (10%); of whom ICA occlusion was AT in 20 (74%) and CE in 7 (26%). Tandem occlusion was a predictor of poor functional outcome in the whole series (OR 4.1, [1.5-11.3], p=0.007). Patients with CE-ICA occlusion were older and had higher baseline NIHSS as compared to AT-ACI. Mortality was high in both subgroups (26% CE vs 29% AT). The probability of poor long-term outcome was strikingly high in the CE subgroup (86% CE vs 63% AT).

Conclusions: Among stroke patients with ICA-MCA tandem occlusions, those associated with CE-ICA occlusion represent a especially severe group with a dramatically poor response to intrave-
nous thrombolysis.

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Development of a telemedicine model: The Victorian Stroke Telemedicine Project (VST)
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Background: Telemedicine can facilitate evidence-based care for patients with stroke in rural hospitals. Telemedicine systems are not widely used for acute stroke care in Australia. We aimed to test the feasibility of a stroke telemedicine protocol incorporating education and clinical advice in an initial pilot study.

Methods: A network of nine urban-based neurologists was on call 24/7 for one rural hospital 200 kms from Melbourne. Neurologists conducted telemedicine via laptops and wireless broadband. Structured feedback was obtained from neurologists and end-users (Emergency Dept clinical staff) to refine the protocol focusing on clinical utility, technology issues, and stroke education. Stroke education included community awareness activities, and staff training in telemedicine. Telemedicine consultations were undertaken for patients with suspected stroke symptoms and who arrived within 4 hours of onset. Patient clinical data were collected and a 3 month outcome follow-up conducted.

Results: The protocol was initiated for 14 patients; 57\% female, median age 69 years (range 29-87 years); 28\% (n=4) received t-PA. There was one communication failure. Of the 13 consultations, 31\% were full video-conferencing consultations (video/audio/brain imaging), and 69\% were telephone only. Neurologists accessed CT scans in 9 cases (69\%). Door-to-consult time ranged from 30–227 mins (median=67 mins). Length of consults ranged from 1–50 mins (median=9 mins). Information technology and clinical factors were reported as facilitating or hindering telemedicine use for the neurologists and ED clinical staff.

Conclusions: Overall the pilot telemedicine protocol was feasible and provided evidence to streamline processes and overcoming technology problems. Modifications following the pilot phase have included connecting via wired rather than wireless networks; and altering Emergency Dept telemedicine clinical workflow processes. The one year phase of the revised protocol is now underway.

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Risk of symptomatic intracerebral hemorrhage in ischemic stroke throm-
bolysis: the SEDAN Score
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Background Symptomatic intracranial hemorrhage (sICH) causes worse outcomes in thrombolysis-treated ischemic stroke patients. We aimed to develop and externally validate a score for assessing the risk of sICH.

Methods Derivation cohort consists of 974 consecutive ischemic stroke patients treated with iv thrombolysis at the Helsinki University Central Hospital. The predictive value of parameters associated with sICH (according to the ECASS-II criteria) was evaluated, and the score was developed according to the magnitude of logistic regression coefficients. Internal cross-validation was performed with 1000 bootstrap replicates. We calculated absolute risks and likelihood ratios of sICH per increasing score points. The score was externally validated in 828 patients from three Swiss cohorts (Lausanne, Basel, and Geneva). We tested performance of the score by means of area under receiver operating characteristic curve (AUC-ROC).

Results The SEDAN score (0 to 6 points) consists of baseline blood Sugar (glucose) [8.1-12.0 mmol/L (145-216 mg/dL)=1; >12.0 mmol/L (>216 mg/dL)=2], Early infarct signs (yes=1) and (hyper) Dense cerebral artery sign (yes=1) on admission CT scan, Age (>75=1), and NIH Stroke Scale on admission (>9=1). Accuracy of the model based on 1000 bootstrap replicates was 93%. Absolute risk of sICH in the derivation cohort was: 1.4%, 2.9%, 8.5%, 12.2%, 21.7%, and 33.3% for 0, 1, 2, 3, 4, and 5 score points, respectively. In the external validation cohort, absolute risks were similar (1.0%, 3.5%, 5.1%, 9.2%, 16.9%, and 27.8%, respectively). AUC-ROC was 0.77 (0.71-0.83; p<0.001).

Conclusion The SEDAN score reliably assesses the risk of sICH in iv thrombolysis-treated patients with acute ischemic stroke and can support clinical decision-making in high-risk patients. External validation of the score supports its generalizability.
Introduction
Thrombo-embolism occurs in patients with both known and undiagnosed malignancy. Stroke may occur in up to 15% of patients with malignancy, but cerebral infarction as the first manifestation of an undiagnosed malignancy is uncommon. The postulated mechanisms for stroke in malignancy include non-bacterial thrombotic endocarditis and pro-thrombotic state.

We report a characteristic pattern of MRI abnormality which allows early recognition of stroke associated with malignancy.

Method
Review of our stroke database between 01/07/2009 and 31/05/2011 revealed 1016 stroke patients. We reviewed the relevant brain imaging and included all patients in whom MRI brain scan had demonstrated multiple vascular territory infarctions. Multiple infarctions in a single vascular territory and lone posterior circulation infarctions were excluded.

We identified other imaging used to confirm the diagnosis of malignancy. This information was cross-referenced with pathology reports, anticoagulation records and case-notes.

Results
Of 735 stroke patients who had an MRI scan, 60 had multiple vascular territory infarctions. 24 (40%) of these patients had an underlying malignancy and in 9 the first presentation of malignancy was stroke. Atrial fibrillation (AF) was identified in only 2 patients with underlying malignancy whereas 11 of 36 patients without malignancy had AF.

In our study the most frequent malignancy was lung (12/24) followed by gastrointestinal, breast and prostate. Adenocarcinoma was the commonest histological type (18/24).

Conclusion
Multiple vascular territory infarction in the absence of AF may indicate underlying malignancy.

In our study 40% of patients with multiple vascular territory infarction had an underlying malignancy and a third of these malignancies presented with stroke and multiple vascular territory infarction. As lung cancer was the commonest malignancy, a chest radiograph is indicated in all patients but further investigations are recommended.
Background: Visual hallucinations in a hemianopic visual field are an already known phenomenon, and could be explained due to an “epileptic” or “release” pathophysiological mechanism. We report the case of a patient in whom complex visual hallucinations and delusions restricted to the visual field deficit were the presenting symptoms of an acute infarction in the territory of anterior choroidal artery.

Case report: 60-year-old ex-smoker male with dyslipidemia, hypertension and paroxysmal atrial fibrillation on warfarin, complained of sudden onset of visual hallucinations and dysmorphopsias restricted to his right visual field. These positive visual perceptual phenomena were both formed and unformed images, non-stereotyped, lasting a few hours and disappeared with saccadic eye movements. The neurological evaluation, in the first day of symptoms, disclosed a right upper homonymous quadrantanopia that the patient was not aware of. The brain CT and MRI scan showed recent retro-lenticular internal capsule and left temporal region ischemic lesions (anterior choroidal artery territory) without cortical hyperintensity on DWI. The EEG was unremarkable. The visual hallucinations became less frequent, remitting in four days.

Conclusion: The complex visual hallucinations are a rare presenting symptom of stroke but one of which clinicians should be aware of. To our knowledge, this is the first case of release hallucinations related to anterior choroidal artery territory ischemia.
Background and Objectives
Unclear onset stroke has been challenging issue to increase the number of patients who are eligible to thrombolytic therapy. However, functional outcome of unclear onset stroke after intravenous thrombolytic therapy were not well known.

Methods
In this retrospective observational study, all consecutive patients, who admitted via emergency room of 9 participating centers nationwide from 2008/04 to 2011/07 and received intravenous thrombolytic therapy with t-PA, were identified based on a prospective stroke registry. Age, Sex, initial NIHSS, risk factors, admission date and time, thrombolytic therapy, and modified Rankin Scale at discharge and/or 3 months were identified. For the patients with unclear onset, last normal time and first abnormal time were recorded.

Results
Among 822 patients received intravenous thrombolytic therapy with t-PA, 115 (14.0%) had unclear onset. In patients with unclear onset, male was 60.0% (vs. 59.9%, p=0.99), mean age was 68.4±12.8 (vs. 66.7±12.9, p=0.21), median initial NIHSS was 13 (IQR 8-18) [vs. 9 (IQR 5-16), p<0.01], history of stroke was 13.0% (vs. 18.0%, p=0.20), hypertension was 71.3% (vs. 61.1%, p=0.04), diabetes was 30.4% (vs. 22.2%, p=0.05), and mRS 2-6 at discharge was 78.3% (vs. 65.9%, p=0.01), mRS 2-6 at 3 months were 69.7% (vs. 55.0%, p=0.11). Unclear onset was not significantly associated with poor functional outcome defined as mRS 2-6 at discharge(adjusted OR=1.44, 95% CI 0.87-2.39) and at 3months(adjusted OR=1.03, 95% CI 0.40-2.63) after adjusting age, sex, initial NIHSS, history of prior stroke, hypertension, and diabetes by multiple logistic regression

Conclusion
Though the patients with unclear onset were more likely to have severe stroke and risk factors, unclear onset per se was not significantly associated with poor functional outcome after intravenous thrombolytic therapy. Still, there could be much room for thrombolytic therapy in patients with unclear onset.
March and December 2011 using remote telestroke technology at four urban spoke hospitals were included in this analysis. Telestroke services were provided by vascular fellowship trained neurologists. Patient characteristics, time to initiation of consult, and treatment decisions were prospectively recorded.

Results: Seventy-eight patients were evaluated by telestroke during the study period; mean age was 65.4 years and 56.4 percent were female. Median time from initial ER call to start of teleconsult was 7 minutes (range 1-51). Average length of consult was 30 minutes. Technical difficulties occurred in 17 consults but only one was major resulting in incomplete assessment. Daytime calls (8 AM to 5 PM Monday through Friday) accounted for 39.7% of all teleconsults. 44 patients (56.4%) were determined to have an acute ischemic stroke or TIA (median NIHSS score 6, range 0-26) by the telestroke neurologist. Of these, 23 (52.3%) arrived within 4.5 hours from onset and in 18 patients (40.9% overall and 78.2% of eligible), tPA was recommended. In the remaining 5 patients, tPA was not recommended due to mild or resolving symptoms in 4 and presence of hypodensity on CT in 1 patient. Transfer to the hub hospital occurred in 18 patients (23.1%) for higher level of stroke care.

Conclusions: Urban telestroke is a rapid and effective way to assess patients with suspected acute stroke. Use of this technology may help increase access to stroke neurologists and thrombolysis rates in urban practice settings where competing clinic responsibilities and poor reimbursement may delay, prevent, and even dissuade on-site evaluation by neurologists.

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Vitamin D Status in the Setting of Acute Stroke
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Background: A low serum 25-hydroxyvitamin D (25-OHD) has been strongly associated with stroke risk factors such as hypertension, atherosclerosis, metabolic syndrome, and inflammation. Although there is not yet enough evidence to establish a causal link, current interventions are exploring vitamin D supplementation and cardiovascular health. The objective of this study is to identify the serum 25-OHD levels of an acute stroke population in Canada. Methods: Data was collected prospectively and analyzed retrospectively from acute ischemic stroke patients between December 1, 2010 and February 28, 2011. Serum 25-OHD tests performed within 30 days of hospital admission were considered suitable for data collection. Confidence intervals (CI) and two-sided t-tests were used to compare our sample’s mean 25-OHD level to the Canadian national average and mean 25-OHD levels of stroke populations in the United Kingdom (UK) and Japan.
P-values <0.05 were considered statistically significant. Results: We included 45 patients with mean age of 71.6 +/- 12.1 years in the study. The mean 25-OHD level was 56.0 +/- 30.0 nmol/L (95% CI: 47.0-65.1). This mean is significantly lower than the Canadian national population’s mean 25-OHD level of 72.0 nmol/L (95% CI: 69.4-74.5). Studies of stroke populations in Japan and the UK exhibited significantly lower 25-OHD levels than our sample’s mean (all p <0.05). Conclusion: Nearly half of our sample (48.9%) had 25-OHD levels less than 50 nmol/L, which is considered deficient by the Institute of Medicine. Studies of other stroke populations exhibited even lower 25-OHD levels than our sample’s mean. Since stroke patients have an increased risk for future hip fractures and often exhibit secondary medical complications that affect their ability to obtain vitamin D from sunlight and diet, healthcare practitioners can consider vitamin D supplementation to help stroke patients meet the recommended dietary allowance.

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**High body temperature: larger benefit of alteplase in ischemic stroke?**

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Background
The relation between body temperature and the effect of treatment with intravenous alteplase is unclear. We assessed the influence of baseline body temperature on the effect of alteplase in the Paracetamol (Acetaminophen) in Stroke (PAIS) trial.

Methods
PAIS was a multi-centre, randomized, double-blind, placebo-controlled clinical trial to assess the effect of high-dose paracetamol on functional outcome in patients with acute stroke. For the present study, we selected all patients with ischemic stroke and randomization within 6 hours of symptom onset. The effect of treatment with alteplase on the score on the modified Rankin scale at 3 months was estimated with ordinal logistic regression, stratified by baseline body temperature. Adjustments were made for age, sex, NIHSS score, previous stroke, atrial fibrillation, smoking, and diabetes mellitus. Associations were expressed as adjusted odds ratios (aOR) with 95% confidence intervals (CI).

Results
Of the 1400 patients in PAIS, 647 were
is used increasingly for treatment of acute symptomatic internal carotid artery (ICA) occlusion, although randomised trials are lacking. Predictors of outcome before initiation of therapy are therefore of special interest.

METHODS: From 1992 to 2010 we treated 201 patients with acute ICA occlusion with intraarterial pharmacological thrombolysis (32), endovascular mechanical therapy (78), or a combination of both (91). All data were assessed prospectively.

RESULTS: There were 76/38% patients with tandem occlusions (ICA plus middle (MCA) or anterior cerebral arteries (ACA)), 18/9% without concomitant occlusions of major intracranial arteries and 107/53% with functional ICA-T-occlusions (ICA plus MCA and ACA). Median baseline NIHSS score was 17, mean time to treatment 300 minutes. Good recanalisation (TIMI 2-3) was achieved in 157/78% patients. Better recanalisation rates were obtained with mechanical approaches, with or without thrombolytics (78/91=86% and 64/87=82%) compared to pharmacological thrombolysis only (15/32=47%; p<0.001). Twelve patients (6%) suffered symptomatic intracranial hemorrhages. Three-month outcome was favourable (mRS 0-2) in 54/28% patients and moderate (mRS 0-3) in 90/46%. 60/31% patients died. Only 17/16% patients with functional ICA-T-occlusions had favourable outcomes compared to 32/44% with tandem occlusions and 5/31% with ICA plus cerebral branch occlusions (p=0.001). In multivariate analysis age (OR=0.96, 95%CI=0.93-
0.98), NIHSS on admission (OR=0.9, 95%CI=0.83-0.98) and functional ICA-T-occlusion (OR=0.35, 95%CI=0.16-0.77) were non-modifiable predictors and vessel recanalisation the only modifiable predictor of outcome (OR=9.30, 95%CI=2.03-42.63).

CONCLUSIONS: Outcome of acute symptomatic ICA-occlusion is poor. However, recanalisation improves outcome and recanalisation rates with mechanical techniques were superior to merely pharmacological recanalisation attempts.

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Intra-Arterial Thrombolysis For Ischemic Stroke: 90-Day Outcomes At A High Volume Primary Stroke Center


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Background: Early clinical trials suggest intra-arterial thrombolysis (IAT) within 8h is safe and effective in a subset of patients with ischemic stroke. We examined 90-day outcomes for patients who received IAT for ischemic stroke in an acute hospital setting.

Methods: We retrospectively studied all adult patients admitted over 18 months beginning 1/1/2010 to a primary stroke center, and who were candidates for IAT for ischemic stroke. Outcomes were examined in the Intent-to-treat population (77 received IAT, 11 did not). The primary outcome was slight or no neurologic disability at 90 days (modified Rankin scores (mRS) <=2). Secondary outcomes included 90 day mortality; recanalization (thrombolysis in cerebral ischemia [TICI] score >= 2, average of treated vessels); symptomatic intracranial hemorrhage (sICH) rates.

Results: There were 88 patients included in our study; 90-day outcomes were unavailable in 14 patients due to loss of follow-up (16%). The majority of patients were Caucasian (71%), female (63%), and were transferred from a referring hospital (61%). The median baseline NIHSS was 18, and median time to IAT was 95 minutes. IV thrombolysis was received in 49% cases (n=25, referring facility; n=18 at SMC). In more than half of cases multiple techniques were used (66%); Clot buster (TNK/tPA) was the most common method of IAT (used in 72% of procedures), followed by the Penumbra device (68%), angiography (32%), and stent (16%). Outcomes at 90-days showed 45% of patients had a mRS <= 2, with 31% mortality. The recanalization rate for IAT was 76% (49%
of TICI scores were unavailable). Eight patients developed a sICH (9.1%); 5 of 8 had an NIHSS >=20.

Conclusion: IAT at our large, single center institution using multiple thrombectomy techniques appears to report similar outcomes to published clinical trial data. We believe multiple forms of IAT effectively achieve revascularization, extending the treatment window for ischemic strokes up to 8h after symptom onset.

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Delays between bolus and infusion doses of alteplase in acute ischaemic stroke - does this affect outcome?
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tals, Newcastle upon Tyne, UNITED
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Introduction: The efficacy of alteplase in acute ischaemic stroke (AIS) is dependent on onset to treatment time (OTT). The processes of pre-thrombolysis assessment and reconstitution of alteplase may result in delays between bolus and infusion doses. Alteplase has a short plasma half-life of 3-5 min. Any bolus-infusion delays might result in subtherapeutic levels which might affect effectiveness. We investigated delays in commencing infusion after bolus of alteplase in AIS and the effect of this on stroke outcome.

Method: Medical and prescribing records of AIS patients thrombolysed in a UK tertiary hospital from April 2008 to July 2011 were reviewed. Demographic, clinical, time to treatment, bolus to infusion delay and outcome [modified Rankin Score (mRS) at 3 months] data were recorded. Delays are grouped as 0-8 and >8 min to reflect the approximate half-way point of plasma clearance after a bolus dose of alteplase.

Results: 116 out of 158 notes were retrieved. Of these, 16 were excluded from analysis mainly for incomplete data. Table 1 shows the degree of bolus-infusion delays. There were no significant differences in demographics, medical history, clinical and aetiological stroke subtypes, mean NIHSS score and OTT between delays of 0-8 and >8 min. Outcome at 3 months based on extent of delay is shown in Figure 1. Logistic regression analysis showed outcome (mRS 0-2 vs 3-6) was not significantly affected by delays between bolus and infusion but by pre-thrombolysis NIHSS score (R 0.143, p value <0.001).

Conclusion: Notable delays occur between bolus and infusion doses of alteplase in AIS and are likely to result in subtherapeutic concentrations for an initial period. Delays do not seem to affect outcome. This finding may be limited by sample size and being single-centred. Studies of the kinetics of alteplase as used in AIS, and the effect of bolus-infusion delays on this, may elucidate our understanding of its relationship with outcome and influence alteplase dosing.

Table 1: Extent of delays between bolus and infusion doses of alteplase*

*Table values are percentages of total delay population.
Stroke, received systemic thrombolysis and had acute ICA-O. Data were extracted from the Austrian stroke unit register and the local thrombolysis database. Outcome measures of interest were recanalization probability of extracranial ICA-O, time-to-recanalization, modified Rankin scale (mRS) and survival at three months.

Results: This study included 95 patients with ICA-O due to atherothrombosis (n=66), cardiac embolism (n=18) or dissection (n=11). The recanalization probability among 55 patients with extracranial ICA-O was 34.5 [21.9-47.1] % (documented at a median of 3 days after stroke) which is double that of stroke patients with extracranial ICA-O not undergoing thrombolysis (15.9 [11.2-20.6] %, n=232). Residual high-grade stenosis was common in the case of an atherothrombotic origin of ICA-O. In patients with extracranial ICA-O, recanalization conferred an early survival advantage (at day 15, P=0.046) but there was no significant benefit at three months. Functional outcome at three months was similar in those with and without recanalization (mRS≤2: 31.5% vs. 22.2%, P=0.67). In 40 patients with intracranial ICA-O, the recanalization probability was similar (30.0 [14.9-45.1] %), however, overall outcome was worse and recanalization emerged as a highly significant predictor of outcome at three months (mRS≤2: 50.0% vs. 7.1%, P=0.0048).

Conclusions: Thrombolysis doubles the probability of recanalization of extracranial ICA-O to about one in three. Recanalization is associated with a short-time delay.

* Overall mean (median, SD) delay: 9.4 (8.0, 7.4) minutes

Figure 1: Stroke outcome at 3 months using mRS categorised by degree of delay between bolus and infusion doses of alteplase

Percentage of patients within category

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Recanalization probability and three-month outcome in extracranial internal carotid artery occlusion
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Background: Although internal carotid artery occlusion (ICA-O) is a common pathology in patients undergoing stroke thrombolysis, reports on recanalization probability and outcome are sparse. Methods: This retrospective analysis included patients who were admitted to the stroke unit in Innsbruck for ischemic stroke, received systemic thrombolysis and had acute ICA-O. Data were extracted from the Austrian stroke unit register and the local thrombolysis database. Outcome measures of interest were recanalization probability of extracranial ICA-O, time-to-recanalization, modified Rankin scale (mRS) and survival at three months.

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478 Acute stroke: current treatment

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Conclusions: Thrombolysis doubles the probability of recanalization of extracranial ICA-O to about one in three. Recanalization is associated with a short-time delay.
Analysis of the SENTIS trial of collateral augmentation using the 3-Factor Sliding Dichotomy

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SENTIS Trial Investigators
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Background: The sliding dichotomy approach to analysis of stroke clinical trials sets win criteria appropriate for each patient based on baseline prognostic factors. The first trials to use sliding dichotomy adjusted endpoint criteria for baseline neurologic deficit only, but age and side of lesion are additional important prognostic factors. The European Stroke Organization consensus statement on trial analysis recently provided an example of a more sophisticated 3-Factor Sliding Dichotomy (3FSD) analytic procedure, incorporating all 3 of these key prognostic features. We re-analyzed clinical outcomes in the SENTIS trial, using the 3FSD approach, across all patients and in the subgroup of earlier treated patients.

Methods: The SENTIS trial was a multicenter, prospective, randomized controlled trial evaluating standard ischemic stroke treatment with and without NeuroFlo collateral augmentation. Adult stroke patients were enrolled if they had a baseline NIHSS of 5-18 and NeuroFlo treatment could be initiated within 14 hrs of the time from stroke onset (TFSO). We analyzed the entire “intention-to-treat” and “as-treated” populations and a hypothesized highly informative subgroup: moderate to severe deficits (NIHSS 7-17) and earlier time window (TFSO <=10 h). Odds ratios were adjusted by age and baseline NIHSS.

Results: Results are shown in Table 1. The full SENTIS population results show a trend toward benefit with NeuroFlo treatment; additional narrowing with time and severity shows significant benefit.

Conclusion: Analysis of the SENTIS trial shows survival benefit but has no significant effect on survival or functional outcome at three months after stroke.
Background. Intravenous tPA is the only approved treatment in acute ischemic stroke. The purpose of this study was to assess the safety, tolerability, and pharmacokinetics of intravenous prourokinase (proUK) in patients with acute ischemic stroke.

Methods. In this pilot open-label dose-escalating study patients were enrolled during the first 6 hs after stroke onset and treated with ascending doses of proUK modified (m-proUK) in its growth factor-like domain and administered as a bolus ranging from 0.1 to 0.4 mg/kg (specific activity about 100000 IU/mg). Adverse effects were assessed with clinical measurements and patient outcome was determined with the NIH Stroke Scale at 24 h and 30 days. Blood samples obtained before and in 2, 15, 30, 45, 60, 90, and 120 minutes after bolus administration were monitored for amidolytic activities of urokinase (UK) and plasmin (Pl). Hemorrhagic transformation (HT) rate was calculated from CT scans done 22-36 hs after m-proUK administration.

Results. Thirty-six patients were treated in 5 dosing tiers; all groups were comparable at baseline with respect to their demographic characteristics and stroke severity. Mortality rate was 11.1%. Asymptomatic HT was observed in 1 patient.

480 Acute stroke: new treatment concepts

A Pilot Open-Label Dose-Escalating Study of Intravenous Modified Prourokinase in Acute Ischemic Stroke


Federal Stroke Center, Moscow, RUSSIAN FEDERATION1, National Cardiology Research and Development Center, Moscow, RUSSIAN FEDERATION2, National Cardiology Research and Development Center, Moscow, RUSSIAN FEDERATION3, Federal Stroke Center, Moscow, RUSSIAN FEDERATION4, Federal Stroke Center, Moscow, RUSSIAN FEDERATION5, Federal Stroke Center Moscow, RUSSIAN FEDERATION6, Moscow, RUSSIAN FEDERATION7, Federal Stroke Center Moscow, RUSSIAN FEDERATION8, Moscow, RUSSIAN FEDERATION9, Moscow, RUSSIAN FEDERATION10, Federal Stroke Center, Moscow, RUSSIAN FEDERATION11

Table 1. Sliding dichotomy results for SENTIS subjects achieving 90-day desired outcomes

<table>
<thead>
<tr>
<th>Population analyzed</th>
<th>Treated % (n/N)</th>
<th>Not treated % (n/N)</th>
<th>Odds ratio [95% CI]</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intention-to-treat cohort</td>
<td>53.2% (103/200)</td>
<td>43.0% (96/224)</td>
<td>1.43 [1.08-1.86]</td>
<td>0.037</td>
</tr>
<tr>
<td>As-treated cohort</td>
<td>49.3% (103/208)</td>
<td>43.1% (90/209)</td>
<td>1.38 [1.03-1.84]</td>
<td>0.017</td>
</tr>
<tr>
<td>Subgroup: NIHSS 7-17, TFSO &lt;=10 hr</td>
<td>49.6% (54/109)</td>
<td>36.9% (49/136)</td>
<td>1.82 [1.03-3.11]</td>
<td>0.029</td>
</tr>
</tbody>
</table>
tient at dose of 0.1 mg/kg. Minor bleed-
ings occurred in 3 (8.3%) patients. In all tiers the activity of UK reached its maximum in the first 2 min after bolus and then decreased to the background level in 45 min. Pl amidolytic activity was observed at doses of above 0.3 mg/kg and had its maximum at 15 min with subsequent decreasing in 90 min after m-proUK bolus. A similar improvement in NIHSS scores over time was seen.

Conclusion. m-proUK doses of 0.1 to 0.4 mg/kg are safe and tolerable in ischemic stroke. Further randomized placebo-controlled trials are needed to investigate the effect of m-proUK on neurological outcome and safety.

482 Acute stroke: new treatment con-
cepts

Should patients with severe acute stroke bypass regional stroke-units?
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Background: Acute large cerebral artery occlusions respond poorly to systemic thrombolysis with rTPA. We prospectively evaluated the outcome after mechanical recanalization with a stent-retriever device in 136 patients. We wanted to know if there are differences in the outcome between patients admitted primarily to our neurovascular center and those admitted via regional stroke-units. Methods: All patients with a NIHSS ≥ 10 undergo CT-angiography. Systemic rTPA is given whenever applicable. Large artery occlusions are treated with mechanical thrombectomy. NIHSS and mRS are assessed on admission and discharge, and all important time frames recorded. Technical success is determined with the TICI scale. Follow-up (FU) data is assessed via telephone interview. Results: 32% had a good clinical outcome (mRS 0-2) at discharge; mortality was 14%, recanalization rate 88%. Mean time from symptom onset to revascularization was 304 min. Early and successful recanalization resulted in a better outcome (p=0.01). Mean FU-time was 10.2 months, with mRS scores improving further during FU (p=0.02). After 90 days 41% had a good outcome, 74% walked independently. In 50 patients with FU of ≥ year mechanical thrombectomy did not lead to an increased rate of recurrent strokes. 80% of patients received rTPA, based on neurological guidelines (bridging), 20% had contraindications. The NIHSS improvement did not differ significantly between these groups (p=0.16). Subgroup analysis for primarily and secondarily admitted patients is ongoing and will be available in May for the ESC. Conclusions: Mechanical thrombectomy led to a good clinical outcome in 1/3 of patients. This is comparable to PROACT II, even though mean the NIHSS was higher in our study. Thrombectomized patients showed potential for further clinical improvement after discharge; they had no elevated risk of recurrent stroke compared to non-interventional procedures. Bridging had no
significant impact on the outcome. The subgroup analysis between primarily and secondarily admitted patients is ongoing; based on the statistical results, we aim at presenting a rationale for stroke-patients with underlying large vessel occlusions.

483 Acute cerebrovascular events (ACE): TIA and minor strokes

New and old clinical scores are equally poor in predicting recurrent stroke after TIA and minor stroke.


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Background: A variety of clinical scores have been developed to predict stroke recurrence after TIA. The prototype ABCD score was subsequently refined in the ABCD² score by the addition of diabetes. More recently a number of other scores have been proposed. We aimed to assess and compare the discriminative predictive value of the ABCD2, ABCD2-I, ABCD-3, and ABCD-3I scores. Methods: In a prospective cohort study, 510 consecutive TIA (including motor and speech symptoms) and minor stroke (NIHSS<4) patients, assessed by a stroke neurologist, underwent CT/CTA within 24 hours of symptom onset. We assessed the risk of recurrent stroke at 7 and 90 days with the ABCD, ABCD2, ABCD³, ABCD2I, and for ABCD³-I score. The discriminative predictive value of these scores for recurrent stroke was determined using ROC curve analyses. We evaluated all patients and subgroups of clinical TIA and patients with full symptom resolution at first evaluation. In addition, we examined the CT/CTA at risk metric (defined as any of: acute ischemia on CT, intracranial occlusion, extracranial occlusion or stenosis ≥50%). Results: Recurrent stroke rates at 7 and 90 days were 5.1% and 7.2% respectively. 7 day recurrent stroke AUC scores were as follows: ABCD2 (0.58, CI95: 0.48-0.69), ABCD3,(0.57, CI95: 0.46-0.68), ABCD3I (0.61, CI95: 0.44-0.76), and ABCD2-I (0.64, CI95: 0.47-0.80). 90 day AUC scores were as follows: ABCD2 (0.59, CI95: 0.50-0.69), ABCD3 (0.58, CI95: 0.49-0.68), ABCD3I (0.61, CI95: 0.48-0.75), and ABCD2-I (0.64, CI95: 0.50-0.78). Scores were similar in clinical TIA patients and patients with complete symptom resolution at the time of first assessment. The CT/CTA metric had an AUC of 0.67, CI95: 0.59-0.76. On direct comparison none of these curves were different statistically.

Conclusion: In this population the currently proposed scores when applied by neurologists do not predict recurrent stroke well. A CT/CTA imaging assessment can stratify risk at least as well as the other scores.
484 Acute cerebrovascular events (ACE): TIA and minor strokes

The Historical Stroke Severity Score (HSSS) Predicts Symptom Progression and functional outcome in TIA and Minor Stroke.
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Background: TIA and minor stroke have a high risk of early neurological deterioration. It has previously been shown that patients with large early neurological improvement are at high risk of subsequent deterioration. In this study we prospectively generated a scoring system for assessing the most severe historical deficit.

Methods: Consecutive TIA or minor stroke patients were enrolled if a stroke neurologist assessed them and CT/CTA completed within 24 hours of onset. The Historical Stroke Severity Score (HSSS) was developed prior to the study to allow measurement of the severity of the historical description of the worst motor deficits. The HSSS included assessment of a. Arm motor power (normal (0), mild weakness or heaviness (1), moderate weakness (2), severe weakness (3)); b. Leg motor power (normal (0), mild weakness or heaviness (1), moderate weakness (2), severe weakness (3)). Arm and leg motor scores were combined, and the highest categories of scores (5 and 6) were combined to give a total score ranging from 0-5. A test or proportion for trend was used to assess the association between the ordered groups defined by the HSS score and symptom progression, recurrent stroke, and mRS at 90 days.

Results: 510 patients were enrolled. The HSSS was rated at the time of first assessment. 19 (3.7% 95% CI 2.3-5.8) patients had symptom progression with a median time to event of one day. The progression rates for total scores ranging from 0 to 5 were 1.4%, 3.7%, 5.9%, 5.4%, 7.1% and 10.7%, respectively. The total HSSS was associated with symptom progression (p=0.004). The HSSS did not predict recurrent stroke. The rates of dependency/death (mRS 3 to 6) for total scores 0 to 5 were 4.2%, 4.6%, 7.1%, 8.1%, 14.3% and 17.9% and the HSSS was associated with mRS (p=0.001).

Conclusions: Taking a detailed history matters when assessing a patient with TIA or a minor stroke. A score based on the patient’s description of the severity of motor symptoms predicts symptom progression and functional outcome.

485 Stroke prognosis

Obstructive sleep apnea syndrome increases the severity of cerebro-vascular lesion in patients with acute ischemic stroke: An MRI study.
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Background
Obstructive sleep apnoea syndrome (OSAS) affects 2 to 4% of the population. OSAS has been associated with a poor functional outcome in stroke patients. In this study we hypothesized that this poor association is the consequence of an increased acute and chronic cerebro-vascular lesion load in patients with OSAS.

Methods
Patients with a first minor to moderate acute ischaemic stroke were prospectively included. Polygraphic sleep recording was performed in the week after stroke onset. OSAS was defined by an apnea-hypopnea index (AHI) $\geq 15$. Acute infarct volume was measured on DWI-sequence using MRI-cron software. Evaluation of chronic vascular lesions included an assessment of the extent of leucoencephalopathy using Fazekas’ scale, a measure of the number of small deep infarct and of microbleeds. Association between OSAS and MRI data was evaluated using Fisher’s exact test and logistic regression analysis.

Results
Among the 118 patients included, a diagnosis of OSAS was made in 47. Patients with OSAS had more severe stroke (NIHSS=6+-5 vs 4+-5; p=0.005) and poorer outcome at 3 months (Barthel index =84+-25 vs 94+-15; p=0.002). A larger infarct volume was found in patients with OSAS (32 +/- 51 cm³ vs 19 +/- 33 cm³; p=0.04). The frequency of moderate to severe leucoencephalopathy was higher among patients with OSAS (90% vs 73%, p<0.03). On multivariate analysis acute stroke volume was independently related to the presence of OSAS while the extent of leucoencephalopathy was independent from OSAS.

Discussion
Increased stroke volume in patients with OSAS is a major determinant of clinical severity while a more diffuse leucoencephalopathy could impair the neuronal plasticity following stroke. Overall these lesions could support the poorer outcome observed in these patients. Because OSAS impair the control of vascular risk factors and increase the severity of cerebro-vascular lesions it should be considered as an independent target in stroke prevention.

486 Stroke prognosis

Long-term survival of young stroke patients: A population-based study from Tartu, Estonia
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Background. A young patient with stroke is always a challenge. Although the outcome of stroke in the young is believed to be better, it still has a significant impact on persons’ quality of life and can be fatal. The aim of this study was to evaluate long-term survival of young
stroke patients in Tartu, Estonia, analyse time-trends of survival and compare the results with other studies. Methods. We have used 2 population-based first-ever stroke registry data (1991-1993 and 2001-2003) to analyse the 1-, 5- and 7-year outcome of young stroke patients by Kaplan-Meier method. These registries included both hospitalised and non-hospitalised cases, ischaemic strokes and cases of intracerebral hemorrhage. Perinatal strokes were not included.

Results. From the group of 1206 patients, 129 (11%) were aged under 55 years. The mean age of patients was 46.1 (+/-9.6) years (range 1 to 55 years). The overall survival rate at 1-, 5- and 7-years was 0.70 (95%CI 0.62-0.78), 0.63 (95%CI 0.55-0.72) and 0.61 (95%CI 0.53-0.70), respectively. The survival was significantly worse for patients with intracerebral haemorrhage (0.31 95%CI 0.17-0.55 at 5 years) compared to patients with ischemic stroke (0.71 95%CI 0.63-0.81; p<0.01) and for those aged 45 to 54 years (0.58 95%CI 0.49-0.69 at 5 years) compared to the younger age group 0 to 44 years (0.73 95%CI 0.61-0.89; p=0.03). There was no difference in overall survival between the two studied periods.

Conclusions. We report low long-term survival rates among young stroke patients in Tartu, Estonia. Increasing age and intracerebral hemorrhage were associated with lower survival. We have previously shown worse outcome for 1-year survival compared to other studies and currently this trend continues for 5- and 7-year survival rates. In fact, these are the lowest survival rates for combined and separate stroke subtypes reported so far.

487 Stroke prognosis

Routine serum C-reactive protein as an outcome predictor in ischaemic stroke patients treated with rtPA
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Institute of Psychiatry and Neurology, Warsaw,

Background
Blood biomarkers may improve the prediction of outcome after ischaemic stroke. However, their clinical usefulness is not yet fully established, especially in patients treated with intravenous rtPA. Our aim was to investigate the predictive value of serum C-reactive protein (CRP) in ischaemic stroke patients treated with intravenous thrombolysis, adjusting for a history of infection recently before stroke.

Methods
We included consecutive patients treated with intravenous rtPA in our stroke center between October 2003 and February 2010. Data was prospectively collected using Safe Implementation of Thrombolysis for Stroke (SITS) methodology and a separate detailed questionnaire including information about preexisting conditions, laboratory findings and medications. Routine serum CRP was measured
within 24 hours from admission.

Results
Serum CRP was measured in 197/232 patients treated with intravenous rtPA, whilst 20/232 experienced an infectious event during 7 days before the stroke onset. Patients with elevated CRP (>5 ng/ml) compared to those with normal CRP values had more preexisting comorbidities, and more severe strokes but a similar prestroke disability. In a multivariate analysis neither elevated CRP nor recent infection were associated with 3-month mortality. However, elevated CRP was independently associated with increased odds for death or dependency (OR 2.09, 95%CI: 1.03-4.26). Elevated CRP also showed a high negative predictive value for sICH according to SITS (100%, 95%CI: 97-100%) and ECASS (97%, 95%CI: 92-99%) definitions.

Conclusion
Our findings support the hypothesis that elevated CRP may be used as an additional predictor of unfavorable long term outcome in patients receiving rtPA that could also facilitate bedside decision making in cases with borderline eligibility for thrombolysis. However, they need to be verified in further large prospective studies.

488 Stroke prevention

SMOKING AT THE TIME OF STROKE IS ASSOCIATED WITH POOR 10-YEAR OUTCOME

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Background: The risk of death and recurrent vascular events in those with stroke is likely to be exacerbated by smoking, but data are limited. We aimed to investigate the association between smoking status at the time of stroke and the risk of death and recurrent vascular events (stroke and acute myocardial infarction) over a period of 10 years after stroke.

Methods: We recruited 1589 cases of first-ever and recurrent strokes from a defined geographical region in North East Melbourne between 1996 and 1999. Both hospital and non-hospital cases of stroke were included. Baseline assessment included ascertaining sociodemographic factors and medical history and the presence of smoking and other risk factors. Over the following 10 years, all deaths were identified through scrutiny of death records, and all recurrent strokes and acute myocardial infarctions (AMI) that were reported at follow up interviews were validated using medical records. Cox proportional hazards regression (adjusted for age, sex and socioeconomic status) was used to assess the association between baseline smoking...
status (never, ex and current) and death, stroke and AMI.

Results: Among those who survived the first 28 days after stroke, those who were current smokers (HR: 1.57, 95% CI: 1.24-1.97, p<0.001) and ex-smokers (HR: 1.23, 95% CI: 1.04-1.44, p=0.013) at baseline had a greater risk of death, stroke and AMI than those who had never smoked. In addition, those who were current smokers had a greater odds of recurrent events than past smokers (ratio of odds ratios: 1.28, 95% CI 0.97 – 1.68, p=0.083).

Conclusions: Patients who smoked at the time of their stroke or had ceased smoking before their stroke had greater risk of death or recurrent vascular events when compared to patients who were never smokers. There appear to be benefits of smoking cessation for patients, with ex-smokers appearing to have a lesser risk of death and recurrent vascular events than current smokers.

489 Stroke prevention

The ABCD2 score as a predictor of prognosis but also accurate diagnosis of TIA in a large teaching hospital service

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Background The ABCD2 score was devised to predict the risk of stroke in patients presenting with transient ischaemic attack (TIA). However older people with vascular risk factors but non-vascular pathology are referred to our service with low and moderate ABCD2 scores. Addenbrooke’s Hospital has an open referral system to TIA clinic. There is some evidence (Josephson et al, 2008) that ABCD2 score may predict those patients who are more likely to have a true diagnosis of TIA. Methods We reviewed the database of patients attending TIA clinic from July 2008 to August 2011. Final diagnosis of TIA or stroke by a vascular neurologist or stroke physician was taken as the gold standard. After excluding those patients diagnosed as having strokes, we analysed the remaining data to see whether presenting ABCD2 score was predictive of accuracy of final diagnosis. Results 1944 patients were seen in TIA clinic between July 2008 and August 2011. After excluding the 342 patients diagnosed with stroke (18%), this left 1602 patients for analysis. 997 patients had an ABCD2 score of ≤3 (63%), 471 had a score of 4-5 (29%) and 95 had a score ≥6 (6%). There was missing data for 39 patients (2%). A diagnosis of TIA was made in clinic for 567 (35%) patients. 1031 patients (65%) were felt to have a non-vascular diagnosis. The group were divided into three categorical groups, ABCD2 score ≤ 3, 4-5 and ≥ 6. Statistical analysis demonstrated that the accuracy of TIA diagnosis increased with increase in ABCD2 score i.e. a correct diagnosis of TIA was made if the ABCD2 score was higher (Fisher exact, \( \chi^2 = 13.86, p=0.00097 \)) - see table 1.

Conclusion In keeping with the limited
literature, our study demonstrates that higher ABCD2 scores are useful to predict diagnosis of TIA. Primary and secondary care referral sources frequently use the ABCD2 score as a diagnostic rather than a prognostic tool. This approach may have some diagnostic value for non-specialists in the setting of very high ABCD2 scores.

<table>
<thead>
<tr>
<th>ABCD² Score</th>
<th>≤3</th>
<th>4-5</th>
<th>≥6</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIA</td>
<td>330</td>
<td>192</td>
<td>45</td>
</tr>
<tr>
<td>Not TIA</td>
<td>666</td>
<td>276</td>
<td>50</td>
</tr>
</tbody>
</table>

**RESULTS:** 1050 consecutive newly stroke patients were enrolled. Stroke subtype was classified as cryptogenic in 372 (35%). 108 were lost of follow-up. In 15 (5.6%) patients was detected AF. The variables associated with the onset of AF were: age (81 [74-86] vs 72 [61-79], p=0.05), pro-BNP>360 (13 (86.7%) vs 103 (41.4%), p=0.001) and a history of hypertension (12 (80%) vs 126 (50.6%), p=0.027). After adjustment for significant variables in the logistic regression model only the proBNP>360 (OR 5.7 [1.1 to 29.3]) acquire statistical significance. Considering the proBNP>360 as a diagnostic test for detection of AF has a PPV: 11.2%, NPV 98.6%, sensitivity 86.7% and specificity 58.6%.

**CONCLUSION:** Serum levels of pro-BNP are associated with cardioembolic stroke and may be useful to reclassify cryptogenic strokes. The purpose of this study is to evaluate the usefulness of pro-BNP for the occurrence of atrial fibrillation (AF) in patients with cryptogenic ischemic stroke.

**METHODS:** Prospective study of cryptogenic strokes (according to TOAST criteria) with clinical follow up: in clinical neurology (6 months) and later by primary care physician (18±12 months) for the detection of AF, vascular events (myocardial infarction, stroke, arterial revascularization, arterial embolism) or death. ProBNP levels were taken within the first 24 hours after stroke onset. According to previous studies a concentration of 360 pg/dL was considered as a cut-off.

**RESULTS:** 1050 consecutive newly stroke patients were enrolled. Stroke subtype was classified as cryptogenic in 372 (35%). 108 were lost of follow-up. In 15 (5.6%) patients was detected AF. The variables associated with the onset of AF were: age (81 [74-86] vs 72 [61-79], p=0.05), pro-BNP>360 (13 (86.7%) vs 103 (41.4%), p=0.001) and a history of hypertension (12 (80%) vs 126 (50.6%), p=0.027). After adjustment for significant variables in the logistic regression model only the proBNP>360 (OR 5.7 [1.1 to 29.3]) acquire statistical significance. Considering the proBNP>360 as a diagnostic test for detection of AF has a PPV: 11.2%, NPV 98.6%, sensitivity 86.7% and specificity 58.6%.

**CONCLUSION:** Serum levels of pro-
BNP>360 pg/mL in patients with cryptogenic acute stroke increases about 5 fold the probability of occurrence of AF. Patients with proBNP<360 pg/mL have low risk of AF during the follow-up.

491 Stroke prevention

Social stratification in use of statins for prevention of recurrent stroke in Sweden
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Background: Evidence shows that statins reduce the risk of stroke, and since 2005 statins are recommended in Sweden to patients with ischemic stroke. The objective of this study was to describe and analyze how statin treatment after stroke has been implemented in different patient groups (country of birth and socioeconomic status) in Sweden during the time period 2004-2009.

Methods: Data from the Swedish Stroke Register have been linked to data from the Longitudinal Integration Database for Health Insurance and Labour Market Studies. Approximately 85% of stroke patients in Sweden are included in the register. Odds ratios for statin prescribing were calculated using a multivariable logistic regression model including age, sex, socioeconomic status, and risk factors.

Results: 108 950 stroke patients were included in the stroke register and discharged alive from hospital after an ischemic stroke during the study period. The proportion of patients discharged with a statin increased from 32.9% in 2004 to 60.1% in 2009. Patients born in Sweden were prescribed less statins compared with patients born in other Nordic countries (OR 1.07, 95%CI 1.01-1.14), Europe (OR 1.31, 95%CI 1.22-1.40) and countries outside Europe (OR 1.20, 95%CI 1.08-1.34). When considering highest level of education, patients with education from secondary school and university had slightly higher odds (OR 1.07, 95%CI 1.04-1.11 and OR 1.05, 95%CI 1.01-1.10 respectively) to receive statins compared with patients with primary school education. Patients in the highest income tertile were prescribed more statins compared with patients with the lowest income (OR 1.24, 95%CI 1.19-1.28), but there was no difference between low and medium income (OR 1.02, 95%CI 0.99-1.06).

Conclusion: This study of stroke patients in Sweden showed a social stratification in prevention of recurrent stroke. Patients with higher income and education received more statins and surprisingly, patients born in Sweden received less statins.
The Effects of Whole Body Vibration on Leg Muscle Activity and Oxygen Consumption in Individuals with Stroke

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Background: Whole-body vibration (WBV) therapy has gained increasing popularity in rehabilitation of various patient populations. However, the influence of WBV on leg muscle activity and oxygen consumption (VO2) in stroke patients is unknown. Methods: 25 stroke patients (8 women, mean age=57±9.84 years, post-stroke duration=5.1±3.7 years) participated in this study. Each individual was exposed to 3 WBV conditions: (1) no WBV, (2) low intensity WBV (frequency: 20Hz, peak acceleration: 9.5m/s2) and (3) high intensity WBV (frequency: 30Hz, peak acceleration: 15.8m/s2). The root-mean-square amplitude of muscle activity of the vastus lateralis and gastrocnemius of both legs was recorded with surface electromyography (EMG) in each of the WBV conditions when the subjects assumed the following postures: static standing, semi squat, deep squat, weight-shifted-forward, weight-shifted-backward, weight-shifted-to-the-side, forward lunge, and single-leg-standing. VO2 (in ml/min/kg) was measured with the Fit-Mate™ metabolic system during the performance of the following static/dynamic exercises in each of the WBV conditions: static standing, dynamic semi squat, static standing with weight shifted to parietic leg, dynamic semi-squat, dynamic weight shifting side-to-side, and dynamic forward lunge. Two-way analysis of variance was used to analyze the influence of WBV and exercise on leg EMG amplitude and VO2. Results: During different body posture/movements, WBV significantly increased leg muscle activity and VO2 compared with no WBV (p <0.05). Both the low-intensity and high-intensity WBV protocols increased the leg muscle activity and VO2 by similar amount (p>0.05). Conclusion: WBV can significantly induce increase in leg muscle activity and oxygen consumption in stroke patients. WBV therapy, when applied on a longer term, may have potential in improving leg muscle strength and physical fitness in this patient group but will require further study.
Objective: Current guidelines recommend that botulinum toxin is injected at the four quadrants of the midbelly of the gastrocnemius muscle (GCM) for the treatment of lower limb (LL) spasticity. However, recent studies on the distribution of the intramuscular endings of the GCM, suggest that the highest branch density is found more proximally; within the upper 10-20% of the calf. This study was carried out to determine if botulinum toxin A (BoNTA), injected proximally, is more efficacious than administration at the midbelly of the GCM.

Design and Method: Forty ambulatory hemiplegic stroke patients from two medical centers were randomized to either: (A) the proximal or (B) the midbelly injection group. The treatment evaluator and injector were blinded to the treatment allocation. All the patients received a single cycle of BoNTA (200 U; BOTOX®) into the GCM, injected according to the randomized treatment protocol and were followed for 8 weeks.

Outcome measures reported in this preliminary analysis were: change from baseline in ankle range of motion; Modified Ashworth Scale (MAS); Clonus Scale (CS) and 10 meter gait speed (GS).

Results: A total of 38 patients (Group A: 21; Group B: 17) completed the study. No differences between the groups were observed at baseline. At Week 8, both groups showed a significant improvement in all the outcome parameters compared to baseline values. However, no significant inter-group differences at Week 8 were noted; ankle range of motion (P=0.2), MAS (P=0.3), CS (P=0.2); GS (P=0.6).

Conclusion: Based on this preliminary analysis from this study, the site of the administration in the GCM did not appear to impact on outcome in patients with LL spasticity following a single injection cycle of BoNTA, as evaluated by a series of functional and non-functional assessment parameters measured 8 weeks after treatment. Longer term follow-up after two or more treatment cycles might be required to demonstrate a differential effect of this approach.

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Evidence-based physiotherapy for upper limb rehabilitation post-stroke: how do we choose the tasks?

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Background: Task-specific physiotherapy
is frequently part of upper limb rehabilitation post-stroke but choice of tasks is rarely justified or related back to clinical assessment. Methods: We developed a standardised clinical algorithm which involved assessment of 18 critical impairments of upper limb function and application of task-specific exercises appropriate to the level of impairment. These tasks were consistent with recent evidence-based guidelines. Twenty participants in the sub-acute phase following stroke underwent outpatient physiotherapy according to the clinical algorithm. Participants’ abilities were regularly re-evaluated and task difficulty progressed. Outcomes were assessed at the level of impairment (Action Research Arm Test, Fugl-Meyer Assessment) and activity (Motor Activity Log).

Results: All participants attended the nine sessions of training over the three week intervention period (100% compliance). No adverse events were reported. There were significant improvements in all outcome measures (P < 0.01).

Conclusion: This evidence-based upper limb clinical algorithm provides a framework for standardising task-specific physiotherapy following stroke based on the assessment of functioning of the individual following stroke in day-to-day life. Physiotherapists new to rehabilitation would benefit from this method of choosing appropriate tasks for patients with impairments of upper limb function. This approach is appropriate for patients with different functional levels and may be used in rehabilitation to standardise groups of self-directed practice sessions or to standardise the intervention and progressions in experimental studies.

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Predicting disability and quality of life after ischemic stroke: A machine-learning-based analysis from the Zurich Observational Registry of Rehabilitation Outcomes (“ZORRO”) C. Globas¹, B. Zenko², A. R. Luft³ Clinic of Neurology, University Hospital Zurich, Zurich, SWITZERLAND¹, Jozef Stefan Institute Department of Knowledge Technologies, Ljubljana, SLOVENIA², Clinic of Neurology, University Hospital Zurich, Zurich, SWITZERLAND³

Background: “ZORRO” was implemented to assess predictors of recovery after ischemic stroke. Aim of this study was to investigate the role of demographic and stroke-specific variables as well as standard assessments conducted in the acute phase and after 6 months in predicting disability and quality of life (QoL) 6 and 12 months after stroke.

Methods: A machine-learning-based predictive modelling (‘M5 model tree’) was applied to 66 stroke survivors to investigate the relationship between post stroke QoL and disability (Stroke Impact Scale (SIS) and Barthel Index (EBI)) at 6 and 12 months and different functional assessments (NIH-SS, mRS, EBI, MMST, Cornell Depression (CDS), Fugl-Meyer-
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Score (FM), 5-meter-walk (5MTW), 6-min-walk (6MW)) conducted in the acute phase and at 6 months as well as between demographic (age, gender, pre-stroke skills/training) and stroke specific features (location, side, etiology, application of thrombolytics, length of hospitalisation).

Results: Higher SIS scores were significantly predicted by age, NIH-SS at discharge from the acute clinic and the acute phase performances in EBI, MMST, FM and 5MTW. The combination of these assessments explained 81% of the variability in SIS outcomes. The strongest predictor of high QoL was a low NIH-SS at discharge. In the model including the assessments collected at 6 months, mRS, FM, CDS predicted SIS at this time point explaining 84% of the variability with mRS being the strongest predictor. EBI at 6 months was predicted by age, MMST, SIS at 1 months and length of stay in acute hospital, with the latter being the strongest predictor. These variables explained 73% of EBI variability.

Conclusions: Standard measures of stroke outcome can reliably predict QoL and disability in the first year after stroke. While the NIH-SS at discharge from hospital seems to be strongest predictor of various assessments collected during the acute phase assessments for SIS outcomes, the mRS seems to be the best at 6 months.

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EXPOSURE TO AN ENRICHED ENVIRONMENT INCREASES POST STROKE ACTIVITY AND DECREASES TIME SPENT ALONE.
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BACKGROUND: Significant evidence supports the use-dependant nature of post stroke plasticity, with greater frequency and intensity of activity strongly predictive of degree of recovery. Despite this, stroke patients spend most of their rehabilitation phase inactive and alone. An enriched environment (EE) facilitates sensorimotor, cognitive and social activity and has been shown to improve motor and cognitive function in experimental stroke. This is the first study to systematically test the feasibility and effectiveness of implementing an EE in a general rehabilitation unit.

METHODS: Prospective non-ran-
Background: Stroke is a leading cause of complex adult disability and many stroke survivors require input from informal carers. While being a carer can be a rewarding experience it is plausible that the demands of care-giving can result in ill health. The aim of this study was to

**Rehabilitation and reorganisation after stroke**

**The Glasgow Carers Cohort Study: informal care giving and risk of ill health**

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Randomised block-design intervention study. Direct observation was used to quantify and compare the change in activity levels (physical, cognitive and social) of stroke patients recovering in a general rehabilitation unit with and without an EE. Activity was recorded every 10 minutes over two 12-hour weekdays and weekend days. An EE was created at both an individual (e.g. music & puzzles) and communal (e.g. interactive gaming & shared dining) level.

RESULTS: Stroke patients exposed to an EE (n=15) were 19% (95% CI 3 to 36, p=0.02) more likely to be engaged in activity compared with those without an EE (n=14). Patients in the EE were 67% (95% CI 10 to 152, p=0.02) more likely to be engaged in cognitive activities and 22% (95% CI 1 to 48, p=0.04) more likely to be engaged in social activities. They were 29% (95% CI 14 to 41, p<0.001) less likely to be inactive and alone and 46% (95% CI 26 to 60, p<0.001) less likely to be asleep.

CONCLUSION: Without high additional cost or significant disruption to staff workload, this simple EE model was feasible to implement and effective in increasing stroke patient activity and reducing time spent alone. A large randomised trial is warranted to determine the efficacy of an EE on function and quality of life after stroke.
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assess the effects of providing informal care on a group of people who provide care to stroke survivors compared to not providing informal care to anyone. Methods: This was a prospective, six month study of two cohorts, one cohort of people who provided informal care to stroke survivors (exposed to care giving) and an age and sex matched random sample of a non care giving reference group for comparison (non exposed). Participants in both exposed and non exposed cohorts had to be at least 16 years of age, fluent in English and free from any informal care-giving activities in excess of 20 hours per week at enrolment. The primary outcome measure was incidence of perceived stress as measured by the Perceived Stress Scale (PSS). Secondary outcomes were psychological well being, psychosomatic symptoms and depression. Results: 28 people exposed to providing care to a stroke survivor were enrolled in this study and 41 age-sex matched non exposed participants were enrolled. Over 6 months of observation, 36% (9/25) of the “exposed” care giving group and 5% (2/39) of the unexposed cohort had their first occurrence of stress (PSS score ≥ 23). Participants who were exposed to providing care had lower happiness scores, mean difference -5.7 (95%CI: -8.0 to -2.5). There was no difference between groups in psychosomatic symptoms or depression score. After adjustment for age, sex and perceived stress at baseline, informal caring was associated with a raised perceived stress odds ratio 6.26 (95% CI: 0.94 to 41.41) but this was not statistically significant (p = 0.058). Conclusions: The results of this cohort study are not conclusive. Nevertheless, they provide stronger evidence than previous studies that exposure to providing informal care to stroke survivors’ affects levels of perceived stress and levels of psychological well-being.

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The Independence of Deficits in Position Sense and Visually Guided Reaching following Stroke

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Background: Several studies have found correlations between proprioception and visuomotor function during stroke recovery. However two more recent studies have found no correlation. Unfortunately, most of the studies to date have been conducted with clinical assessments of sensation that are observer-based and have poor reliability. We have recently developed new tests to assess position sense and motor function using robotic
technology. The present study was conducted to reassess the relationship between position sense and upper limb movement following stroke.

Methods: We assessed position sense and motor performance of 100 inpatient stroke rehabilitation subjects and 231 control subjects. All subjects completed quantitative assessments of position sense (arm-position matching task) and motor performance (visually-guided reaching task) using the KINARM robotic device. Subjects also completed clinical assessments including handedness, vision, Purdue Peg Board, Chedoke McMaster Stroke Impairment Scale and FIM. Neuroimaging documented lesion localization. Fisher’s exact probability tests were used to determine the relationship between performances on the arm-position matching and visually-guided reaching task. Pearson’s correlations were conducted to determine the relationship between robotically measured parameters and clinical assessments.

Results: Performance by individual subjects on the matching and reaching tasks was statistically independent (Fisher’s test, P<0.01). However, performance on the matching and reaching tasks both exhibited relationships with abilities with daily activities as measured by the FIM. Performance on the reaching task also displayed strong relationships with other clinical measures of motor impairment.

Conclusions: Our data support the concept that sensory deficits are functionally relevant and point to the importance of assessing sensory and motor impairments independently when planning treatment strategies.

Figure 1. Exemplar control subject. A) Arm-position matching task. B) Passive (robotically moved) hand positions have been mirrored onto those of the active hand for visualization purposes. C) Individual hand paths for movements to each of the eight targets. D) Velocity profiles for hand paths from the centre.

Figure 2. Exemplar subjects with stroke. Two stroke subjects who performed within normal limits on both tasks (A & B), outside the normal range on the matching task,
But normal on the reaching task (C & D) normally on the matching task, but were abnormal on the reaching task (E & F) and abnormally on both tasks (G & H).

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White matter lesion severity and functional outcome in acute ischemic stroke.

Background: To determine if severity of visually assessed white matter disease (WMD) is associated with poor functional outcome after ischemic stroke. Methods: First ischemic stroke patients who participated in the Berlin Cream&Sugar study, received an MRI, and completed follow-up between January 2009 and December 2010 were enrolled. Severity of WMD was assessed on fluid attenuated inversion recovery (FLAIR) or T2-weighted sequences using the Wahlund and Fazekas visual scales. Functional outcome was assessed after 1 year using the modified Rankin Scale (FU mRS).

Results: Of 101 patients (37% female, median age 67 years, IQR 54-75, NIHSS 1, IQR 0-2), median FU mRS was 1 (IQR 0-2). Both Fazekas and stratified Wahlund scores significantly associated with grouped FU mRS (p<.05; excellent outcome mRS 0-1, poor outcome mRS >1). Post hoc analyses showed that severe WMD was associated with poor functional outcome (Wahlund: unadjusted OR 8.6, 95% CI 2.1-35.7; p=.003; Fazekas unadjusted OR 4.7, 95% CI 1.4-15.7, p=.018). Binary logistical regression revealed that Wahlund score > 10 and Fazekas scores of 2 independently associated with worse outcome (Wahlund: adjusted OR 15.4, 95% CI 2.3-98.8; Fazekas: adjusted OR 4.2, 95% CI 1.1-15.3). Conclusion: Severe WMD defined by standard criteria in acute ischemic stroke patients is associated with poor functional outcome at 1 year and can be assessed using visual rating scales. The Berlin “Cream&Sugar” study is registered with EudraCT (2009-010356-97) and clinicaltrials.gov
Small vessel stroke and white matter disease

UNRAVELING PATHOPHYSIOLOGICAL MECHANISMS OF CEREbral SMALL-VEssEL DISEASE BY GENE EXPRESSION ANALYSIS IN HUMAN BRAIN TISSUES.

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Cerebral small-vessel disease (SVD) is a common condition in older people and contributes to the development of vascular dementia (VaD). This disease is characterized by leukoaraiosis depicted by CT and MRI. A limited number of studies of its genetic basis have been performed so far.

To identify genes and pathways involved in the development of SVD, we analysed the gene expression of brain specimen of the frontal cortex, thalamus and frontal white matter of 5 deceased patients diagnosed with SVD in comparison to 5 non-affected patients, using oligonucleotide-based microarray technology (Affymetrix Genechips). Raw data were analysed with Partek Genomics Suite in order to identify and annotate genes, and to compare their expression in both groups. Genes with fold expression change (F) <-1.5 or >1.5, and a P value <0.01 were considered statistically differentially expressed between SVD and control specimens.

The 3-D visualization of the Principal Component Analysis of all the samples revealed that white matter samples were grouped apart from the two other regions. However, identification of differentially expressed genes showed similar alteration of gene expression in the three brain regions, involving ubiquitin-mediated proteolysis, cell adhesion, cell cycle, glutathione and fatty acid metabolisms. Genes involved in apoptosis and platelet aggregation were found differently expressed in the cortex and thalamus of VaD patients. Genes involved in myelination, angiogenesis and vesicular transport were differently expressed in the cortex only, whereas the expression of genes involved in glycolysis and nitrogen metabolisms were changed specifically in the white matter.

These results indicate that brains of patients suffering from SVD presented disturbances of various pathways in the explored brain regions. This molecular analysis may give new insights to patho-
physiological mechanisms of cerebral SVD. The alterations include brain white matter as well as brain cortex.

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Enlarged perivascular spaces in spontaneous intracerebral haemorrhage: prevalence, anatomical distribution and associations with clinical and radiological factors

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Background: Spontaneous intracerebral haemorrhage (ICH) is caused by the rupture of small arteries damaged by cerebral small vessel diseases (SVD) including sporadic cerebral amyloid angiopathy (CAA) and hypertensive arteriopathy. Enlarged perivascular spaces (EPVS) are a recently recognized neuroimaging marker of ischaemic SVD, possibly reflecting blood-brain barrier (BBB) dysfunction. EPVS may also provide important insights for the pathophysiology, diagnosis and management of ICH. We determined the prevalence, distribution and severity of EPVS in ICH, and investigated associations with other SVD imaging markers, and with ICH aetology.

Methods: Cases were ascertained from consecutive cohorts with ICH from 3 specialist stroke centres. EPVS in the basal ganglia and centrum semiovale were rated using T2-weighted and FLAIR MRI sequences using a validated scale graded from 0 to 4 (where 0 is no EPVS and 4 is >40 EPVS). We also rated white matter changes (WMC), cerebral microbleeds and lacunes using validated scales.

Results: We included 78 patients with ICH (46 with clinically probable or possible CAA based on the Boston criteria). All patients had some EPVS; the mean total score was 3.74 (SD 1.16). After ad-
Introduction
*There is much pathologic heterogeneity between periventricular and deep white matter hyperintensities (WMHs), which cannot be distinguished with current MRIs. Periventricular WMHs are more strongly associated with vascular risk factors and brain atrophy. 7 Tesla MRI has an increased signal-to-noise ratio and enhanced spatial resolution compared to 3.0 Tesla MRI, and could be used to distinguish WMHs. We hypothesized that blood vessels had to be seen in WMHs in patients with cerebral small vessel disease. Moreover, we hypothesized that periventricular WMHs would harbour more blood vessels than deep WMHs.

Methods
Eight patients with an acute lacunar infarct were enrolled. Using 3D Magnetized Prepared Fluid Attenuated Inversion Recovery images, WMHs were counted and classified as periventricular (defined as <1 cm distance from the ventricle) or deep. Hypo-intensities in WMH were counted as blood vessels when they 1) could be visualised in at least 2 perpendicular planes, 2) appeared linear/tortuous in at least one plane, and 3) were completely surrounded by hyperintense signal in at least one plane(fig 1). Chi-square tests were used to test for a difference between prevalence of blood vessels in periventricular and deep WMHs.

Conclusion: EPVS are frequent in ICH, with a higher prevalence than reported in healthy elderly populations, suggesting that they may be a useful imaging feature of SVD in patients with ICH. Total and basal ganglia EPVS severity are associated with WMC severity, suggesting common pathophysiological mechanisms in ICH (which may include BBB dysfunction). A predilection of severe EPVS for the centrum semiovale rather than the basal ganglia may be indicative of CAA.
Results
We counted 114 WMHs (interpatient range 5-26). Periventricular and deep WMHs were equally prevalent (49.1 vs 50.1%). The mean prevalence of blood vessels was 72.8% in the study population (interpatient range 56.3%-87.5%). There was a significantly higher prevalence of blood vessels in periventricular WMHs compared to deep WMHs (82.1 vs 63.8% (p=0.028). After adjustment for age, sex and surface area of WMHs, this difference remained significant.

Conclusion
Using 7T MRI, we found a high prevalence of blood vessels in WMHs. There was a significantly higher prevalence of blood vessels in periventricular WMHs compared with deep WMHs, suggesting a different pathologic substrate for periventricular WMHs in cerebral small vessel disease.
Thursday 24 May 2012
Poster Session Blue

Chairs:
R. Ackerman, USA, H. Bäzner, Germany, J. Betlehem, Hungary, A. Carolei, Italy, M. Correia, Portugal, V. di Piero, Italy, M. Fisher, USA, M. Giroud, France, A. Grau, Germany, T. Karapanayiotides, Greece, J.S. Kim, South Korea, K.R. Lees, UK, A. Massaro, Brazil, B. Norrving, Sweden, T. Richards, UK, J. Saver, USA, C. Stam, The Netherlands, D. Tanne, Israel

Epidemiology of stroke --- p.541
Acute stroke: emergency management, stroke units and complications --- p.576
Acute stroke: clinical patterns and practice --- p.642
Acute stroke: current treatment --- p.678
Acute stroke: new treatment concepts --- p.710
Acute cerebrovascular events (ACE): TIA and minor strokes --- p.740
Stoke prognosis --- p.762
Stroke prevention --- p.814
Rehabilitation and reorganisation after stroke --- p.844
Vascular surgery and neurosurgery/interventional neuroradiology --- p.880
Small vessel stroke and white matter disease --- p.930
Are Anger or Strenuous Exertion Important Triggers for Stroke and TIA?

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BACKGROUND: There is robust evidence that episodes of physical exertion are associated with onset of myocardial infarction (MI). This effect is largest in habitually sedentary individuals whereas those who exercise regularly are protected. There is also similarly strong evidence for triggering of myocardial infarction by episodes of anger. In contrast, there are few data on triggering of stroke and TIA by anger or exertion.

METHODS: We conducted a case-cross-over study of anger and exertion preceding TIA and ischaemic stroke in patients ascertained in a population-based study (Oxford Vascular Study). Patients completed validated scales for levels of anger and exertion during the two hours prior to the event versus the same time on the previous day.

RESULTS: 950 patients completed the questionnaire, usually within 2-3 days of the acute event, of whom only 58 (6.1%) reported anger or strenuous exertion in the two hours before onset of a TIA or stroke. However, anger or strenuous exertion were more frequent in the two hours before onset of a TIA or ischaemic stroke than during the control period (anger or strenuous exertion - OR=3.5, 95% CI 1.7-7.5, p<0.001; anger alone - 3.6, 1.6-9.2, p<0.001; strenuous exertion alone - 2.3, 0.5-14). Anger and exertion were most strongly associated with TIA (4.6, 1.7-15.0, p<0.0001) and with TIA or stroke in women (5.7, 1.6-30, p=0.003). Patients whose usual frequency of exercise was above average for their age were protected from triggering by exertion and also by anger.

CONCLUSIONS: Episodes of anger or strenuous exertion can act as triggers of TIA and stroke, but this occurs less commonly than previously reported for MI.

Validation of haemorrhagic stroke in The Health Improvement Network (THIN)

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Background: Medical record databases are often used for research purposes, but the validity of the original data needs first to be assessed. We determined the validity of recorded incident episodes of haemorrhagic stroke within The Health
Improvement Network (THIN) UK primary care database.
Methods: We identified individuals within THIN aged 20–89 years with a first recorded haemorrhagic stroke (computer-detected cases) in 2000–2008, based on Read codes. The records of these patients were validated by a manual review of computerized clinical records including free-text comments of all computer-detected cases, followed by a review of medical records of a random sample (n = 400) along with a questionnaire completed by their primary care physician (PCP). The results of this validation study can be used subsequently to calculate a positive predictive value (PPV) of the diagnostic coding for haemorrhagic stroke in THIN.
Results: We identified 4330 computer-detected cases. After manual review we discarded 697 cases, resulting in 3633 potential cases: 2283 cases of intracerebral haemorrhage (ICH) and 1350 cases of subarachnoid haemorrhage (SAH). Most of the cases discarded after manual review were cases of ischaemic stroke (35%), trauma-related (25%) or the initial diagnostic suspicions were not confirmed (16%). We reviewed medical records and PCP answers to a questionnaire for 306 potential cases and 63 discarded cases. A total of 251 were confirmed, giving a PPV of 82%. The PPV was higher for SAH (91%) than for ICH (73%). Among discarded cases, we found that 89% were correctly discarded whereas 11% were confirmed as true cases by the PCPs.
Conclusions: Computer detection of stroke cases in THIN followed by manual review of the computerized clinical profiles has proven to be a valid and powerful method of identifying cases of haemorrhagic stroke. Our results suggest that the validity of recorded SAH diagnostic codes is greater than that of recorded ICH diagnostic codes.

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Stroke specific case mix adjustment to compare case fatality after stroke across international systems of care. T.M. Hemmen¹, S. Middleton², M. Pelly³, E. Vaux⁴, G.J.E. Rinkel⁵, A. Bottle⁶ for the Stroke Global Outcomes Accelerated Learning (GOAL) Investigators University of California, San Diego, La Jolla, USA¹, Dr. Foster Ltd, London, UNITED KINGDOM², Chelsea and Westminster Hospital NHS Foundation Trust, London, UNITED KINGDOM³, Royal Berkshire NHS Foundation Trust, Reading, UNITED KINGDOM⁴, UMC Utrecht Stroke Centre, Utrecht, THE NETHERLANDS⁵, Dr Foster Unit at Imperial College London, UNITED KING-
Background: Stroke is a leading cause of case fatality and morbidity worldwide. There are significant variations in stroke incidence, cause and outcomes across different regions and countries. The Stroke GOAL project is facilitated by Dr Foster® Intelligence in cooperation with hospitals in Europe and North America. Our aim is to improve systems of care and patient outcomes after stroke. We developed stroke specific Case mix indices (CMI) and tested those in comparison to non-specific models across hospitals from different countries and regions. Methods: We included all stroke discharges from 30 academic medical centers (10 UK, 11 US, 7 Netherlands, 1 Belgium, 1 Italy) between 2005 and 2010. Patient diagnoses were defined using ICD 9 and 10, Death as in hospital, within 30 days. We analyzed models of risk adjustment for all strokes, acute ischemic stroke (AIS), intracranial hemorrhage (ICH) and subarachnoid hemorrhage (SAH): 1) Charlson weights (CW), 2) CW analysis recalibrated with regression analysis using our dataset, 3) Elixhauser Index (EI) recalibrated using this dataset, 4) A combined index including all 31 EI variables, plus dementia, myocardial infarction and coma. Hospital-level relative risks (RRs) were derived in each case and the sets compared. We performed a Receiver Operator Characteristics analysis with c-statistic testing each model. Results: 94,172 hospital discharges were included, 64,099 with AIS, 17,193 with ICH and 12,880 with SAH. Death occurred in 11.3% AIS patients, 30.4% ICH and 18.2% SAH. The relation between original CW and death was not linear, with scores of 0-4 having equal rates and >4 having equally higher rates. Model 4 performed best in terms of discrimination and was satisfactory (c=0.75 for all strokes, versus 0.72 - 0.73 for models 1-3). Small to moderate changes in RRs across models were common, with a mean absolute difference of 3.4 between models 1 and 4 for all strokes combined. Conclusion: Using stroke specific CMIs was only slightly superior to using the standard CW. The hospital specific risk ranking varied little between the four models in AIS and ICH. SAH RRs can differ considerably from all-stroke RRs.

Corelation between variations of of circle of Willis with hypoplasya of A1 segment of anterior cerebral artery and ischemic stroke.

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Anterior cerebral artery hypoplasia of A1 segment is a cause of ischemic change and ischemic stroke. Anterior cerebral artery hypoplasia of A1 segment is a fetal variant of circle of willis(C.W) with 3%-13% frequency. Impaired of collateral blood flow of C.W is a risk factor for ischemic change and ischemic stroke. In our study we have examined 60 patients with ischemic stroke comparated...
with control group. All patients have done angioMRI within 72h of stroke. In our group we have found 9 patients with (15%) with hypoplasia of A1 segment, and in control group 2 patients (3.3%), so it was higher in our group. The majority of patients had ipsilateral striatal lacunar cerebral infarct.

Conclusion: Anterior Cerebral Artery hypoplasia of A1 segment is a risk factor for ischemic change and ischemic stroke, especially in striatal area.

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The recovery trajectories in acute stroke
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Background. To describe recovery trajectories in acute stroke over 3 months and clinical and sociodemographic correlates of these trajectories. Methods. Longitudinal data from 230 patients admitted to Stroke Care Unit at the Royal Melbourne Hospital (Victoria, Australia) between January and June 2011 were analyzed. Latent class modeling using mplus software was used to identify patterns of change in disability (modified Rankin Score) during 3 months following acute stroke. Correlates of recovery trajectories were assessed using Kruskal-Wallis and Chi-Square tests. Results. Patients mean (SD) age was 68.6 (14.1) and 58% were males. Latent class analysis identified 7 recovery trajectories in acute non-fatal stroke (see Figure 1). Trajectories 1 (n=55, 24%) and 7 (n=24, 10%) represented patients who were not impacted by stroke, with no change in disability scores during the study. Stroke had no long-term impact on functioning of individuals who fell into trajectories 3 (n=13, 6%) and 5 (n=31, 14%), with mild increase in disability following stroke and full recovery at three months. Individuals in trajectories 2 (n=30, 13%) and 4 (n=50, 22%) showed partial recovery following stroke while trajectory 6 (n=27, 12%) reflected a large increase in disability following stroke and no improvement at 3 months. Stroke type (hemorrhagic vs ischemic) (p=.256) and atrial fibrillation (p=.052) were not related to recovery trajectory. Increasing severity of stroke impact was associated with younger age (p=.002) and with higher NIH Stroke Scale scores at baseline (p=.003). Smokers had higher probability of poor recovery (p=.003) while history of ischemic heart disease (p=.014) and previous stroke (p=.020) were associated with better recovery. Linguistic background (English vs other) and socio-economic status (measured using Index of Economic Resources) also predicted recovery trajectory (p=.035 and p=.045, respectively) although there were no clear trends. Conclusion. This study identifies stroke recovery pathways and their predictors, providing potentially useful tool for identifying individuals at elevated risk of poor recovery and in need of targeted intervention.
Stroke on-awakening: patients’ characteristics, outcomes and potential for reperfusion therapy.

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Background: Stroke on-awakening is common amongst ischemic stroke (IS) patients. Findings on differences in characteristics and outcomes of patients with wake-up stroke and those reporting onset of stroke while awake are inconclusive. Currently, the efficacy of reperfusion therapy for selected wake-up stroke is studied in clinical trials. We studied the proportion, characteristics and outcomes of wake-up stroke patients and estimated the number of potential candidates for reperfusion therapy in an unselected comprehensive national registry of hospitalized patients. Methods: IS patients in the first three National Acute Stroke Israeli (NASIS) registry periods (2004, 2007, 2010; 2-month each) were included. Data were collected with a structured questionnaire during hospitalization. We defined three outcome variables: in-hospital neurological complications; poor functional outcome defined as death, mRS>=2 or discharge to a nursing home, and in-hospital mortality. Patients’ characteristics and outcomes were compared by wake-up/non wake-up stroke and risks for poor outcomes were estimated with logistic regression analysis. Results: Wake-up IS was reported for 820/4408 (18.6%) patients. We found no significant differences in age, sex or prevalence of vascular risk factors between patients with wake-up stroke and those with onset of stroke while awake. ORs (95% CI) were 1.2 (0.9-1.6) for neurological complications, 0.8 (0.7-0.98) for poor functional outcome and 0.8 (0.5-1.2) for in-hospital death. According to an estimate of 20-40% prevalence of penumbra, wake-up stroke patients could add 3.7-7.4% to the total number of IS considered eligible for tPA treatment. Conclusion: Stroke on-awakening is present in almost one-fifth of IS patients. Characteristics and stroke outcomes are similar for patients with and without wake-up stroke. Confirmation of a valid approach for the detection of wake-up stroke patients who can potentially benefit from reperfusion therapy is essential.
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Predicting who will return to paid employment after stroke: the Psychosocial Outcomes in Stroke (POISE) cohort study

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Background: Each year approximately 12,000 Australians of working age survive a stroke. An ability to participate in paid employment has been identified by younger stroke survivors as having important psychological and economic consequences.

Methods: The POISE study (Psychosocial Outcome In Stroke)[1] is the largest cohort of young (<65 years of age) stroke survivors. Consecutive participants <65 years of age were recruited within 28 days of stroke from hospitals and stroke units in the greater Sydney metropolitan region, NSW Australia. Stroke was defined according to WHO standard criteria. A range of validated demographic, clinical, mental health, cognitive and disability measures including return to paid employment were obtained over the 12 months following stroke. Multivariate logistic regression was used to determine factors associated with returning to paid employment within 12 months of stroke.

Results: Among 441 participants, 218 were in paid full-time and 53 in paid part-time work immediately before their stroke, of whom 202 (75%) returned to paid part- or full-time work within 12 months of their stroke. Being male, female without an illness that restricted activity before stroke, younger, independent in activities of daily living (ADL) at 28 days after stroke, and having private health insurance was associated with return to paid work, following adjustment for other illnesses and a history of depression before stroke (C statistic 0.81). Work stress and post stroke depression showed no such independent association.

Conclusion: Given that independence in ADL is the strongest predictor of return to paid work within 12 months of stroke, these data reinforce the importance of reducing stroke-related disability and increasing independence for younger stroke survivors.


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Infarcts exacerbate the association between white matter lesions and brain atrophy, suggesting individual vulner-
The ability to ageing-related brain damage

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Background

White matter lesions (WML) and cerebral atrophy increase stroke risk and cognitive impairment, commonly occur together in older people and are weakly co-associated. Infarcts (silent or symptomatic) also increase with age. A closer association between WML and atrophy in subjects with than without infarcts could provide information about individual vulnerability to brain damage. We tested whether the association between WML and atrophy differs in subjects with vs without infarcts on imaging.

Methods

Intracranial (ICV), total brain (TBV), CSF (total, ventricular and superficial subarachnoid space, SSS) and WML volumes were measured on brain MR scans of 676 community-dwelling older subjects (Lothian Birth Cohort 1936; T1-, T2-, FLAIR, T2*-weighted images), some of whom had had cortical or subcortical infarcts. We masked infarcts visible on imaging to avoid distorting WML or CSF volumes. We tested for differences between groups (Mann-Whitney U), and associations between WML volume and brain atrophy (general linear modelling, GLM), adjusting for gender and ICV. Results 95 subjects had an infarct (age median+/-IQR 72.8+/-1 years, 55 male); 581 did not (72.7+/-1 years, 303 male). All CSF volumes were larger in subjects with than without infarcts (P<0.03); TBV and ICV did not differ between groups. Subjects with infarcts had larger WML volume (15300+/22328 mm³) than those without (7184+/11761 mm³, P<0.001). On GLM, WML volume increased linearly with ventricular volume in those with (F=5.9, P=0.017, Partial Eta square η²=0.061) but not those without (F=0.53, P=0.47, Partial Eta square η²=0.001) infarcts.

Conclusions

WML and brain atrophy (especially ventricular enlargement) are worse, and the association between WML and atrophy is stronger, in those individuals with than without infarcts, suggesting that infarcts are associated with increased general vulnerability to brain damage at a given age in older subjects.
Background: Hypertension and age are the most relevant risk factors for the presence of silent cerebrovascular lesions (SCL), stroke and dementia. The prevalence of SCL and their relation with future stroke and dementia is unknown in Mediterranean hypertensive population. We aimed to determine SCL prevalence in hypertensive population, to evaluate their associated factors, and to assess the incidence of stroke and MCI or dementia after three years.

Material and methods: Prospective observational study in 1000 participants with essential hypertension, aged 50-70 years with no prior history of stroke or dementia. Patients have been randomly selected, after stratification by age and sex from 14 primary care centres in Barcelona. A brain MRI is performed to assess the prevalence of several brain lesions (infarction, white matter changes and microbleeds among others) and demographical and clinical data have been collected on baseline. Other than brain target organ involvement (kidney, heart and peripheral and central arteries) will be also assessed in all patients, and several case-control studies nested in this cohort in patients with and without SCL will be presented (24-hour ABPM, retinography and blood biomarkers). Patients will be followed up annually for at least 3 years to assess the incidence of stroke and cognitive impairment.

Results: Over 14 months, 800 patients have been enrolled (91% acceptance rate), 54% female with a mean age of
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Prevalence of stroke-with-dementia among Asians
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Background:
Community-based data on the burden of vascular cognitive impairment among Asians is lacking. This study was performed to determine the prevalence of stroke-with-dementia in a multi-ethnic Asian population.

Methods:
The community-based Stroke, Parkinson’s Disease, Epilepsy and Dementia in Singapore (SPEEDS) Study randomly recruited adults aged >50 years. They were screened for cognitive impairment using the Abbreviated Mental Test or a self-report of progressive forgetfulness. Those who screened positive were assessed for dementia by DSM-IV criteria. Subjects were also screened for stroke using the WHO Protocol for Neurological Diseases, or a self-report of stroke. Those who screened positive were examined for stroke using the WHO definition. Those who met the criteria for both dementia and stroke were diagnosed to have stroke-with-dementia (SWD). Data was analysed using SPSSv17.0.

Results:
14,819 adults participated, female:male=1.21:1, Chinese:Malays:Indians=3:1:1, median age 62yr (range 50.1-92.6yr). 23.3% had no formal education, 35.0% had > 6yr. Overall SWD prevalence was 0.56% (95%CI 0.45-0.70). It was non-significantly higher in males (0.58% vs 0.54%, p=0.27), rose with increasing age (p<0.001), fell with increasing education (p=0.047). It was non-significantly higher among Indians (0.87%, 95%CI 0.54-1.38) compared to Chinese (0.55%, 95%CI 0.42-0.72) and Malays (0.52%, 95%CI 0.30-0.92), p=0.12. After adjusting for age, gender and education, compared to Chinese, the odds of SWD was 2.19 (95%CI 1.24-3.85, p=0.007) among Indians, and 1.45 (95%CI 0.83-2.55, p=0.19) among Malays.

Conclusions:
SWD prevalence among older Singapore adults is 0.56%. It rises with age, falls with education. It is more prevalent.
among Indians compared to Chinese and Malays. The reasons for these differences need further study.

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Incidence of intracerebral haemorrhage and subarachnoid haemorrhage in the general population

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Background:
Primary intracerebral haemorrhage (ICH) and subarachnoid haemorrhage (SAH), both types of haemorrhagic stroke (HS), are reported to occur in the developed world with an incidence of ~1.5 and ~0.9 cases per 10 000 person-years, respectively [1, 2]. We used a primary care database, The Health Improvement Network (THIN), to estimate the incidence of ICH and SAH in the UK general population.

Methods:
We conducted a retrospective cohort study, including all individuals registered in THIN aged 20–89 years during January 2000–December 2008 (the study period). Those with a prior diagnosis of HS were excluded. Individuals were followed from the first day within the study period when they met the criteria of: ≥ 2 years enrolment with a primary care practitioner; ≥ 1 year since their first computerized prescription; and at least one encounter recorded in the previous 2 years. Follow-up continued until the earliest occurrence of one of the following endpoints: case detection; 90 years of age; death; or study-period end.

Results: The study cohort comprised 2 110 327 individuals, who were followed for an average of 5.8 years. We identified 3137 cases of HS during follow-up (1797, ICH; 1340, SAH). The corresponding incidence was 1.5 and 1.1 per 10 000 person-years for ICH and SAH, respectively. The incidence of ICH per 10 000 person-years was higher in men (1.7 vs 1.3 in women) and in those aged ≥ 80 years (7.6 vs 0.1 in those aged < 40 years). In contrast, the incidence of SAH per 10 000 person-years was higher in women (1.3 vs 0.9 in men) and relatively constant across age groups. In men and women aged 80–89 years, the incidence of ICH was 8.5 and 7.1 per 10 000 person-years, respectively; for SAH, the incidence was 1.3 and 1.4, respectively.

Conclusion:
Crude estimates of the incidence of ICH and SAH in this UK population were comparable to those of previous reports [1, 2]. In line with previous studies, age and sex greatly influenced these rates. 1. Lovelock CE et al. Lancet Neurol 2007;6:487–93. 2. de Rooij NK et al. J Neurol Neurosurg Psychiatry
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Lipid differences in two Hispanic ischemic stroke populations


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Background: Significant differences in stroke mortality, risk factors and stroke subtypes have been described between Hispanics and other race-ethnic subgroups. Few studies have addressed differences amongst Hispanics. Our objective was to compare lipid profiles in a predominantly Caribbean Hispanic stroke population in Miami and a Mestizo Hispanic stroke population in Mexico City.

Methods: We analyzed ischemic stroke Hispanic patients with complete fasting lipid profiles at baseline from the prospective registries of 2 tertiary care teaching hospitals in Mexico City and Miami. Demographic characteristics, risk factors, stroke subtypes (TOAST criteria), and first fasting lipid profile were compared. Multiple linear logistic regression analysis was performed to compare lipid fractions.

Results: A total of 560 patients were analyzed: 324 from Mexico and 236 from Miami. Compared to Miami Hispanics, Mexicans were younger (58.3±16.7 vs. 67.4±13.8 years, p<0.0001), had lower prevalence of hypertension (53.7% vs. 79.7%, p<0.0001), lower body mass index (BMI) (27±4.4 vs. 28.5±6.7, p=0.005), and lower rates of cardioembolic strokes. Small vessel and large vessel disease-related stroke, diabetes...
mellitus and tobacco use were similar. Multivariate analysis adjusting for age, sex, hypertension, diabetes, smoking, BMI, and TOAST category showed significantly lower LDL (-18.8 mg/dL, 95% CI -27.2, -10.6) and higher triglycerides (29.3 mg/dL, 95% CI 12.7-40.2, p=0.0003) in Mexicans compared to Miami Hispanics. Similar levels of HDL were observed in both groups.

Conclusion: We found significant differences in lipid fractions between two Hispanic stroke populations, with lower LDL levels and higher triglyceride levels in Mexicans compared to Caribbean Hispanics. These findings highlight the heterogeneity of dyslipidemia amongst the Hispanic race-ethnic group. Future studies are needed to discern the relative contributions of environmental as well as genetic factors to these disparities.

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Clinical profiles of intracerebral hemorrhage in high-aged patients
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Background and Purpose: The incidence of intracerebral hemorrhage (ICH) increases with age. ICH patients with advanced age may have several limitations of acute care and recovery from ICH. We investigated baseline characteristics, hematoma features, and outcomes of high-aged patients with acute ICH as compared with younger ICH patients.

Methods: We enrolled consecutive ICH patients admitted within 24 hours after onset between 2004 and 2009. Patients were divided into two groups; those with 80 years old or older and those under 80 years old. Outcomes were compared by adjusting for sex and the initial NIHSS score; favorable outcome was less common (16.4% in high-aged patients, OR
Methods
The first CI event aged 40 and over (17,878 cases) in Akita stroke register was used in this study. Incidence rate of CI with AF in the cortical lesion and an excess recurrence event by AF were calculated by age and sex. Prevalence of total AF in the population was estimated by upper two results as a numerator and a denominator. The prevalence of paroxysmal AF among the population was cleared by the prevalence of total AF minus known prevalence of chronic AF in Japan (Int J Cardiol 2009;137:102-107).

Results
Prevalence of AF/100000 by age and sex was as follow;
Chronic AF in 40-49 years old was 238 and proximal AF was 99 in men. That was 37 and 40 in women, respectively. That of 50-59 years old was 784 and 712 in men, 115 and 129 in women. That of 60-69 years old was 1941 and 2745 in men, 418 and 560 in women. That of 70-79 years old was 3438 and 4221 in men, 1120 and 1343 in women. 80 years old and over was 4431 and 8092 in men, 2188 and 4014 in women.

Conclusion
Prevalence rate of chronic AF and paroxysmal AF by age decade and sex were cleared by means of the stroke register in Japan. Event of paroxysmal AF was common in the population, especially in men and in old age.
Introduction
Gender differences in stroke is widely used to evaluate quality indicators in stroke care. Moreover provides an opportunity to analyze gender differences in the acute stroke setting and in the outcome.

Methods
Prospective study of 1362 consecutive patients with ischemic stroke (786 male, 57.7%; 576 female, 42.2%) admitted to our hospital February 2009 and September 2011. The objective was to explore gender differences. We analyzed demographics, risk factors, clinical and etiologic subtypes, clinical course, diagnostic and therapeutic resource utilization and in-hospital and follow-up prognosis with modified Rankin scale and Barthel Index.

Results
No differences were found on arrival and transfer to the hospital. The interval onset-symptoms to the emergency room was significantly higher in men (8.88 vs 5.05 hours. Women were older (78.9 vs 72.1 years) and more significantly impacted by acute stroke with higher baseline NIHSS in admission. Risk factor profiles differed between the 2 genders, with women having a higher incidence of atrial fibrillation and hypertension. We didn’t find differences in other variables. The women had higher use of Computed Tomography and lower user of Magnetic Resonance Imaging, ultrasounds and cardiac studies. The subtypes cardio-embolic and undetermined were more prevalent in women than in men. The antithrombotic or thrombolytic treatment...
were then followed for 9.3 years on average. Carotid atherosclerosis was evaluated by high-resolution ultrasonography (7.5MHz transducer) in the common carotid artery (CCA) and internal and external carotid arteries (ICA and ECA, respectively). The means of the minimal lumen-intima diameters (CCAi) and the maximal media-adventitia diameters (CCAa) for both sides of the CCA were used at the beginning points of dilation of the Bulbs in the diastolic phase. The risks of stroke across quintiles according to carotid arteries diameters were compared by the use of multivariable-adjusted Cox proportional-hazards models.

Results: We documented 128 ischemic, 51 hemorrhagic, and 12 unclassified strokes events. The multivariable-adjusted hazard ratios (HRs; 95% confidence intervals [CIs]) in the highest quintile of the CCAi diameter for all strokes and hemorrhagic strokes were 2.1 (1.2 to 3.7) and 5.9 (1.6 to 21.7), respectively, compared with the lowest quintile of the CCAi diameter. The multivariable-adjusted HRs (95% CIs) for all strokes, ischemic strokes, and hemorrhagic strokes were 1.6 (1.3 to 2.0), 1.5 (1.2 to 1.9), and 2.3 (1.5 to 3.3) in 1-mm increments of the CCAi diameter, respectively. Those for all strokes and hemorrhagic strokes were 1.2 (1.0 to 1.4) and 1.5 (1.1 to 2.1) in 1-mm increments of the ICA diameter, respectively. The risks of strokes for the CCAa diameter were similar to those for CCAi.

Conclusion: Carotid artery enlargement may be a good predictor for stroke in general populations.

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Carotid Artery Diameter is Positively Associated with Stroke in a General Urban Cohort: The Suita Study
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Background: No study has examined the association between carotid artery diameter and the incidence of stroke in general populations. We assessed the hypothesis that carotid artery diameter was a positively associated with stroke events in a general urban Japanese population.

Methods: We studied 5,339 Japanese individuals (mean age 55.3 years, without stroke or ischemic heart disease) who completed a baseline survey and carotid ultrasonography in the Suita Study, and drugs were similar used. The cumulative recurrence rate was not significantly different. At month, 3 months and 6 months the disability in women was statistically higher. In-hospital mortality was similar, but statistically higher in women at follow up.

Conclusions
Women were older and more significantly impacted by acute ischemic stroke. Thrombolytic treatment was used at similar rates for both genders. Research is needed to determine whether the differences noted here are genuine and clinically important, and to identify factors determining this worse outcome.
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ACUTE ISCHEMIC STROKE IN PATIENTS OLDER THAN 70 YEARS IN GREECE: 12 YEARS EXPERIENCE IN A TERTIARY GENERAL HOSPITAL
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Background: Acute ischemic stroke is one of the leading causes of death and prolonged hospitalization worldwide. The burden of Stroke is likely to increase substantially in the future because of the aging population. The aims of our study were to examine the demographic and clinical characteristics on 1775 patients older than 70 years admitted with acute ischemic stroke, between 1999 and 2010.

Methods: A retrospective study was performed on patients admitted with acute ischemic stroke. The following data were recorded: age, sex, season and year of attack, days of hospitalization and outcome.

Results: 47.8% of the admissions were men. The mortality rate was 8.7%. The mean age was 72.66 years and the mean period of hospitalization was 15.75 days. The incidence of ischemic stroke was higher in winter and spring and was decreased the last two years of the study. Significant correlations were found between season and mortality (r = -0.069; p<0.01), sex and year (r = 0.067; p<0.01), age and sex (r = 0.061; p<0.05), age and days of hospitalization (r = 0.17; p < 0.01), year and days of hospitalization (r = 0.15; p<0.01) and between age and year (r = 0.13; p<0.01).

Conclusion: Women patients were increased over the years. Patients of age over 75 were increased over the years. Advanced age was correlated to female sex and prolonged length of hospitalization. The mortality is higher in winter and spring.

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Seasonal and diurnal variations in stroke onset and stroke severity in southern hemisphere: Findings from the Royal Melbourne Hospital Stroke Registry 2004-2011
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Background. In the northern hemisphere, the onset of stroke peaks between 10:00 and 12:00 hours and in winter. In this study, we assessed the relationship between stroke onset and stroke severity in the southern hemisphere. Methods. Data were analyzed from 5,791 Stroke Registry patients at the Royal Melbourne Hospital, Australia. Circadian and seasonal variations in stroke frequency were assessed using regression model for related counts data to account for non-random frequency of stroke occurrences. Temporal differences in stroke severity (NIH Stroke Severity Scale) were assessed using analysis of variance.
Results. The mean (SD) age of patients was 69.9 (15.3) years; 55% were males. 52% were ischemic strokes, 16% were haemorrhagic and 31% were pseudostrokes. Stroke frequency varied significantly across time of day, day of the week and month of the year (p≤.001). Stroke frequency was lowest at 00:00-07:00 (10.5%, 95% CI 9.5-11.5) and highest at 07:00-13:00 (33.2%, 95% CI 31.7-34.8). Strokes peaked at 09:00-10:00 and 12:00-13:00, >6% of all strokes occurring in each of these one-hour intervals. Stroke occurrence was highest on Mondays (15.7%, 95% CI 14.8-16.7) and lowest on Fridays (12.7%, 95% CI 11.8-13.6). Strokes were most frequent in February (9.0%, 95% CI 8.3-9.8) and May (9.2%, 95% CI 8.5-10.0) and least frequent in July (7.3%, 95% CI 6.6) and September (7.2%, 95% CI 6.5-7.9). Stroke severity differed significantly across time of day and month of the year (p<.001) but not across days of the week (p=.374). Most severe strokes occurred at 13:00-19:00 (M=13.6, 95% CI 12.1-15.1) and least severe strokes at 7:00-13:00 (M=9.2, 95% CI 7.8-10.5). Least severe strokes occurred in December (M=5.2, 95% CI 3.2-7.2) while July, August, and September had the highest stroke severity (M=14.5, 95% CI 11.5-17.5; M=12.3, 95% CI 8.9-15.6; M=12.8, 95% CI 9.1-16.5).

Conclusion. Frequency of stroke peaks between late morning and early afternoon and is highest on Mondays and during transition from warmer to colder season. Most severe strokes occur in the afternoon and during cold season. This information can be used to help understand stroke aetiology and in planning of emergency services.

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Stroke incidence and case-fatality ten years apart in Northern Portugal - 1999 to 2010: data from a community-based study

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Background

One decade ago Portugal had one of the highest stroke incidences among the Western European countries. Based on the population ageing stroke incidence is predicted to rise, but on the other hand much has changed since 2000. Population awareness measures were implemented, hopefully reflected in a widen use of preventive strategies, and acute treatment approaches are being constant-
ly tested and innovated. The objective of this study is the comparison of stroke incidence and case-fatality ten years apart, 2000-2010.

Methods
All suspected first-ever-in-a-lifetime strokes occurring between October 2009 and September 2011 in 46775 residents in rural areas and 193349 urban residents were entered into a stroke registry. Based on standard definitions, both hot and cold pursuit sources of information were used for case ascertainment. Patients were observed at onset and at three months. All data is currently being validated and by March 2012 the definitive results will be available. Meanwhile the results presented refer to the preliminary results of the first year (September 2009-10).

Results
Based on the first year results, it is expected a decrease in the annual incidence of stroke, 2.8/1000 (95%CI, 2.6-3.0) to 1.8/1000 (95%CI, 1.6-2.0), though still higher in rural compared to urban populations. Mean age at onset increased from 71 to 73 years, the proportion of women is lower (54.5 vs. 58.7%) and among patients with a definite diagnosis the proportion of ischaemic events increased slightly from 80% to 84% contrasting with primary intracerebral haemorrhages (17 to 13%). The overall 28 days case-fatality decreased from 16.1% (95%CI, 13.6-19.1) to 10.6% (95%CI, 8.0-13.8).

Discussion
Both, incidence of stroke and case-fatality are decreasing ten years apart. The population ageing is also shown in the ageing of patients, but the efficacy of treatment in the acute phase may underlie the decline of case-fatality. Supported by FCT/FEDER project PIC/IC/82858/2007

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The comparison of public knowledge of stroke warning signs and risk factors between 2000 and 2010
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Background: Poor public awareness of stroke warning signs and risk factors limits the use of effective therapies and prevention. The aim of our study was to investigate community knowledge of stroke symptoms and risk factors and to analyze temporal trends after ten years. Methods: The awareness of stroke signs and risks of 303 respondents at the Department of Neurology of the Faculty Hospital Brno was assessed by a structured questionnaire during 2010. The results were compared with similar population of 300 respondents examined in the Department of Neurology in 2000. Results: Thirty two percent of our respondents could not name any stroke
warning sign, 68% respondents named ≥ 1 warning sign of stroke and only 40% respondents correctly named ≥ 2 stroke warning signs in 2010. There was no significant change regarding knowledge of stroke warning signs between 2010 and 2000. In 2010 26% respondents didn’t know any risk factors, 74% named ≥ 1 risk factors and 61% correctly named ≥ 2 stroke risk factors. Statistically significant improvement of stroke risk factors knowledge was seen between 2010 and 2000 (p<0,001). The most frequent source providing the information about stroke signs and risks were mass media, particularly magazines (30%) and television (27%). Physicians as the source of knowledge were cited more frequently in year 2010 compared with 2000 (19% vs. 7% [p<0,001]). Conclusion: Public knowledge of stroke risk factors within our region has significantly improved, while knowledge of stroke warning signs did not improve from 2000 to 2010. Discrepancy between these results could be explained by wide public awareness of common vascular risk factors rather than by awareness of specific stroke signs. Public health education should continue and focus on population at the high risk of stroke.

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Prediction of vascular risk after stroke – protocol and preliminary data of the Prospective Cohort with Incident Stroke (PROSCIS)
Background We systematically evaluated evidence for differences in stroke incidence, and in proportions of stroke pathological types and ischaemic subtypes in Chinese versus white (European-origin) populations.

Methods: We comprehensively sought population-based studies since 1990 of incidence of first-ever stroke, and of proportions of its main pathological types (ischaemic, intracerebral haemorrhage [ICH], subarachnoid haemorrhage, unknown) and ischaemic subtypes in Chinese populations (China, Hong Kong, Taiwan). For stroke types/subtypes, we included both hospital- and community-based studies and studies including recurrent as well as first-ever strokes. We calculated and compared between studies: direct age-standardised (WHO standard population) stroke incidence; and proportions of each pathological type and ischaemic subtype.

Results
Baseline characteristics of the first patients in Berlin (n=194) and Munich (n=62) respectively were: Median age 68.0 (IQR 60.0-77.25) and 71.5 (IQR62.0-81.0), female 77 (40%) and 27 (43.6%), median NHISS at admission 2 (IQR1-4) and 3 (IQR1-6), prevalence of hypertension 67% and 74.2%, arterial fibrillation 16.5% and 16.1% and diabetes 18.0% and 16.1%. (table 1)

Conclusion
Preliminary results show that the study protocol is feasible. Given the detailed initial cardiovascular screening and the standardised follow-up the development of a prognostic score with excellent discrimination abilities for stroke patients is expected to be possible.

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How does the epidemiology of stroke in Chinese populations differ from white populations of European origin? A systematic review
Background: Overall and gender-specific rates of subarachnoid haemorrhage (SAH) are reported to be low in China. The CHina Epidemiology Research In Subarachnoid Haemorrhage (CHERISH) study aims to provide reliable estimates of incidence, risk factors and outcome of SAH in this country. Methods: CHERISH was a prospective, population-based, frequency-matched case-control study of spontaneous SAH in well-defined district sections (1.53 million population age ≥15 years in 2010) of Baotou, the largest city in Inner Mongolia, China, over a 2 year period in 2009-2011. Cases of spontaneous SAH were prospectively identified through surveillance of 11 collaborating hospitals, multiple smaller hospitals and clinics, and the single city crematorium. Verbal autopsy procedures were used to ascertain probable out-of-hospital cases. Rates were calculated using a person-year approach, and age and sex standardised to the WHO world standard population using the direct method. Results: There were 226 SAH cases (av. age 58±13 years; 65% female), 50% with a history of hypertension 31% current smokers, with a median Hunt and Hess scale score of 2 (iqr 2 to 3). Crude, and age- and sex-standardised annual incidence (per 100,000) of SAH was 7.4 (95%CI 6.4 to 8.3) and 10.0 (95%CI 9.0 to 11.0), respectively. Rates were higher in females than males: age-standardised annual incidence 12.7 (95%CI 10.5 to 14.9) and 7.3 (95%CI 5.5 to 9.1); female/male ratio 1.88 (95%CI 1.44 to 2.47). Conclusions: This study contradicts prior
Etiology and risk factors in young patients with ischemic stroke
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Background: Previous studies, most based on small numbers of patients from single centers, suggest that etiology and risk factors in young adults with ischemic stroke differ from those seen in older patients. We aimed to analyze etiology and risk factors among the multicentre nationwide cohort of the PORTYSTROKE.

Methods: 364 patients with ischemic stroke, aged 18-55 years, included consecutively, during one year in 12 hospital neurology departments in Portugal were studied. Etiology was classified according to TOAST criteria. Comparisons were done between groups stratified by gender and age.

Results: Mean age was 45.3 years(y), 61.8% were males. Distribution according to age categories was: 18-25y n=11 (3%), males 36.4%; 26-35y n=31 (8.5%), males 58.1%; 36-45y n=113 (31.6%), males 58.4%; 46-55y n=209 (57.4%), males 65.6%. Separating patients into two age categories: C1=18-45y and C2=46-55y, distribution of risk factors in C1 versus C2, respectively, was the following: Hypertension 29.7% vs 54.5% (p<0.001); Diabetes 7.7% vs 20.1% (p<0.001); Dyslipidemia 42.6% vs 51.2% (p=n.s.); Smoking 44.5% vs 37.8% (p=n.s.); Alcohol 40.6% vs 50.7%; Oral contraception (females) 71.6% vs 26.2% (p<0,001); Migraine 27.1% vs 19.1% (p=n.s.); Migraine with aura 26.2% vs 20.0% (p=n.s.). Family history of stroke in C1 vs C2, respectively, was 41.9% vs 44.5% (p=n.s.) and of migraine 22.6% vs 14.4% (p=0.043). Stroke etiology in C1 vs C2, respectively, was the following: Cardiac embolism 23.2% vs 21.1%; Large artery disease 9.7% vs 19.1%; Small artery disease 21.3% vs 31.1%; Other known cause 9.7% vs 5.7% (including dissection 8.4% vs 2.9%), Unknown cause with complete investigation 23.2% vs 10.5%; Unknown cause without complete investigation 12.9% vs 12.4%.

Conclusion: Among young patients with ischemic stroke, those over 45 years account for more than half of the cases. Etiology and risk factors start resembling those seen in the elderly in early midlife.
Background: Regional variation in stroke management is well recognised. We aimed to compare the degree of variation in the hospital management of intracerebral haemorrhage (ICH) between European and Chinese sites participating in INTERACT2.

Methods: INTERACT2 is an international, open, randomised controlled trial to determine the effects of early intensive blood pressure (BP) lowering in patients within acute ICH and elevated systolic BP (150-220 mmHg). Descriptive statistics were used to test for differences in the management of 1745 patients from China and 406 patients from Europe.

Results: There were highly significant (p<0.0001) regional differences in management, with higher proportions of patients in Europe receiving swallowing assessment (70.9% in Europe, versus 12.1% in China), allied health input (83.6% vs 7.8%), subcutaneous heparin (72.5% vs 0.2%), vitamin K (4.9% vs 0.5%) and recombinant Factor VIIa (2.4% vs 0.5%), but lower proportions of patients receiving mannitol (8.9% vs 84.7%).

Conclusion: There is large regional variation in the background management of patients with ICH participating in INTERACT2. This is likely due to differences in local practice customs and the availability of resources, but it also highlights the use of treatments with limited evidenced-based support.

Prevalence of Intracranial Stenosis in a Norwegian ischemic stroke population
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Background: Intracranial stenosis (IS) is an important cause of ischemic stroke worldwide. Prevalence of IS in a North-European, unselected ischemic stroke population is unknown. This study aimed to evaluate the prevalence of IS in a well-defined community based ischemic stroke population using a multi-modal non-invasive approach.

Methods: In a prospective study, patients admitted with TIA or ischemic stroke underwent MR-Angio and/or CT-Angio, and standardized TCCS examination. Criteria for the diagnosis of IS were positive findings on at least two of the modalities MRA, CTA, and TCCS. Criteria for symptomatic stenosis were 1) presence of DWI-MR signal attenuation in the territory supplied by the stenotic artery and 2) absence of more likely causes of ischemic stroke.

Results: Among 607 patients (583 with stroke, 24 with TIA) included over an 18-month study period, 54 (8.9%) presented 76 IS. Forty patients (6.6%) presented symp-
tomatic IS. The degree of symptomatic IS was > 50% in 27 patients.

Conclusion
IS represents the cause of ischemic stroke in ~7% in this Norwegian stroke population.

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Baseline Characteristics and OnabotulinumtoxinA (BOTOX®) Dosing Patterns in Adult Focal Spasticity: MOBILITY - A Prospective Observational Cohort Study
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Background: The MOBILITY Project is an observational study designed to capture data on patient reported outcomes and treatment patterns in patients receiving OnabotulinumtoxinA for approved indications in Canada, including adult focal spasticity (AFS). Methods: Demographic, diagnostic and treatment data were collected from newly-treated (naïve) and previously-treated (maintenance) patients who received at least one dose of OnabotulinumtoxinA. In this interim analysis, we describe the baseline characteristics and dosing patterns of 387 patients with AFS. Results: The most common etiologies of AFS reported were stroke (n=206, 62%), multiple sclerosis (n=48, 14%), spinal cord injury (n=44, 13%), and traumatic brain injury (n=22, 7%). Eighty-six percent (86%) were Caucasian, 49% female (mean age 49 yr) and 51% male (mean age 52 yr). The mean BMI of all AFS patients was 27±6. Twenty-eight percent (28%) of AFS patients were unemployed while 14% were employed, 36% were retired, and 22% were self-employed, students, or on disability. 153 patients (40%) were naïve and 234 (60%) were on maintenance therapy. Mean OnabotulinumtoxinA dose at the first treatment visit was lower in all naïve patients (267U±133U vs 358U±163U in maintenance patients) and remained lower at the fourth subsequent treatment cycle (315U±168U vs 358U±152U in maintenance patients). Of patients starting OnabotulinumtoxinA therapy, 25% received a dose of greater than 400 U compared to 47% of maintenance patients. The majority of patients (84%) received electromyographic and/or electrostimulation guided injections. Conclusion: Interim data from the MOBILITY Project confirm that stroke is the most common etiology for AFS in Canada, most patients are not employed, and suggest that AFS patients naïve to OnabotulinumtoxinA treatment receive lower doses than those on longer-term maintenance therapy, and that guided injections are commonly used.
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The stroke epidemiology in different regions of Russia by method of territorially populational register in 2009-2010 years

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Stroke incidence rate in Russia is one of the highest in the world, and stroke mortality rate goes third after heart diseases and tumours of all locations.

Background and purpose: The aim of the work is to study rates of incidence, attack, mortality and fatality cases from stroke in Russia in 2009-2010. Methods: The research was executed with the Register method according to the uniform criteria of Methodological Instruction Russian National Association of Fight against Stroke. Study of epidemiological stroke indexes was conducted in open population of men and women older than 25 years in different regions of Russia. The number of residents was 1,864,932 in ten regions in 2009 and 3,388,932 residents in thirteen regions in 2010. The number of stroke cases registered in 2009 was 3,961; 1,853 stroke cases and 2,108 ones, among men and women, in accordance. The number of stroke cases registered in 2010 was 8,552; 4,038 stroke cases and 4,515 ones, among men and women, in accordance. Results: In 2009 a stroke incidence rate was 3.52 cases per 1,000 population. In 2010 - 3.27 per 1,000 population. In 2009 a stroke case mortality rate was 1.19 per 1,000 population. In 2010 - 0.96 per 1,000 population. Significant distinctions of parameters of stroke incidence, mortality and case fatality are revealed between the researching country’s regions. Reduction of hemorrhagic stroke was revealed in 2009-2010 years. Parity of ischemic stroke to hemorrhagic stroke was 5:1. Neuroimaging methods (computer tomography and magnetic resonant tomography) were passed for differential diagnostics of stroke character in 2009-63.1% cases and in 2010-74.2% cases. The share of stroke patients, who received treatment at hospital for in-patients in 2010 was 91.1%.

Conclusion: This project on the territory of the Russian Federation is a scientific basis of the treatment organization and medically social rehabilitation of stroke patients and a preventive maintenance of stroke incidence.

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A population-based study of pre-morbid blood pressure in patients with small vessel TIA and stroke

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BACKGROUND: There is some evidence that hypertension is a particularly important risk factor for small vessel (SVD) stroke. However, the relative
importance of systolic (SBP) versus diastolic (DBP) blood pressure is uncertain. We studied pre-morbid DBP and SBP in patients with SVD events versus other subtypes overall and in relation to family history of parental hypertension.

Methods: In a population-based study with stroke and TIA (Oxford Vascular Study), we studied all pre-morbid BP measurements over the 10 years preceding the event from primary care records. Aetiological subtype was categorised using the TOAST classification.

Results: In 1659 patients with over 20,000 pre-morbid BP measurements, mean (SD) pre-morbid SBP (mmHg) was similar in patients with SVD events versus other events (145.7/14.7 vs. 145.2/15.8), but DBP was higher in those with SVD events: mean/SD pre-morbid DBP = 83.0/7.1 vs. 80.6/7.6, p<0.0001; most recent DBP=80.7/9.6 vs. 77.7/10.9, p<0.0001. Results were similar in the subset of 1238 patients with adequate family history data: mean (SD) pre-morbid DBP = 83.2/7.2 vs. 80.6/7.7, p<0.0001; most recent DBP=80.8/9.5 vs 77.7/10.7, p<0.0001. Family history of parental hypertension was associated with SVD events (OR=1.8, 95%CI 1.2-2.7) and with higher DBP: mean (SD) pre-morbid DBP=82.1/7.6 vs.80.8/7.7, p=0.04; most recent DBP=80.7/10.4 vs. 77.8/10.6, p<0.0001).

Conclusion: Increased DBP but not SBP is associated with lacunar TIA and stroke and with parental history of hypertension. Diastolic hypertension might play a particular role in the heritability of cerebral small vessel disease.
Readmission after stroke – a preliminary study of a Portuguese stroke unit
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Background: Readmission after stroke is not well characterised in the literature, although the burden of stroke is recognised as a major health problem. This preliminary retrospective observational study aims to characterise the causes for readmission after stroke in a cohort of stroke unit patients.

Methods: We included ischaemic and haemorrhagic stroke patients consecutively admitted in our stroke unit between January and May 2010. Readmissions and its causes after 3 months, 6 months and 1 year where identified. The variables studied included age, gender, vascular risk factors, type of stroke, clinical stroke Oxfordshire classification, NIHSS and modified Rankin scale (mRS) scores at first event discharge and after readmission. Statistical analysis: software SPSS V20.0.0 (p<0.05).

Results: Of the 253 patients who were discharged alive from our stroke unit, (15.4%) were readmitted in our hospital at least once after a mean time of 8 months (12% at 0-3 months, 40% at 3-6 months and 48% at 6-12 months). Readmitted patients included 52% male and had a mean age of 65 years-old. At index hospitalisation (readmitted patients cohort) the first event was ischaemic stroke in 71% - 32% (n=9) were TACI, 27%
Background: in the European population about 10% or less of all stroke cases are intracerebral hemorrhages (ICH). Uncontrolled hypertension is the most significant risk factor for ICH. In this study we tested whether the rate of ICH differs within one city between 2 districts with different living standards.

Methods: of the 23 districts in Budapest city, the average personal monthly income in District-12 (D-12) is over 80% higher than in District-8 (D-8). The database of the National Health Insurance Fund using ICD-10 codes of hospital discharge reports was used to identify those who were hospitalized in 2007 for stroke, with postal codes corresponding to addresses in these 2 districts. Case certification was performed by personal visits to the general practitioners. Demographic data including age at stroke onset and gender, as well as stroke subtypes were analyzed using the anonymized

(n=8) LACI, 22% (n=6) PACI and 19% (n=5) POCI, 46% were dependent (mRS >2) and the mean NIHSS was 7. Major causes of readmission were recurrent stroke/TIA (21%), respiratory infections (13%) and hip fracture (1%). The most frequent co-morbidities found in readmitted patients were hypertension (59%), dyslipidemia (41%) and atrial fibrillation (22%); 90% had multiple co-morbidities. No correlation was found between mRS or NIHSS score at discharge and readmission.

Conclusions: Our preliminary data showed that stroke/TIA and respiratory infections were major causes of readmission. This study may contribute to identify patient subgroups that may need improvement of secondary prevention measures and prevention of stroke complications.

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Lower living standard is associated with higher rates of intracerebral hemorrhage – the Budapest District 8-12 Project

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Background: There limited population-based data on risk factors of subarachnoid haemorrhage (SAH) in China. The CHina Epidemiology Research In Subarachnoid Haemorrhage (CHERISH) study aims to provide reliable estimates of incidence, risk factors and outcome of SAH in this country. Methods: CHERISH was a prospective, population-based, frequency-matched case-control study of spontaneous SAH in well-defined district sections (1.53M population age ≥15 years in 2010) of Baotou, the largest city in Inner Mongolia, China, over a 2 year period in 2009-2011. Cases of spontaneous SAH were prospectively identified through multiple ‘hot’ and ‘cold’ city-wide surveillance activities. For each case, two healthy controls (family members or friends of other patients) without SAH were matched by gender, 5-year age strata, and district of residence. Data on medical history and lifestyle factors were collected from cases and controls by structured interview of the subject or a proxy informant. Conditional logistic regression models were used to assess associations between key risk exposures and SAH. Results: There were 226 SAH cases (mean age 58 years; 65% female), but 7 were without matched controls, leaving 219 SAH cases and 434 matched controls.

Results: of the 438 admissions with acute stroke (227 in D-8 and 211 in D-12), there were 27 ICH cases in D-8 and 8 cases in D-12 (chi-square test, p<0.01). Those with ICH at the poor district (D-8) are over 10 years younger than those with ICH in the wealthy district (64.5±17.2 and 74.8±10.4 years, p=0.13). The number of population per one general practitioner (GP) is similar in the two districts (554 in D-8 and 544 in D-12).

Conclusion: a significantly higher rate of ICH in the less wealthy district together with a tendency of ICH appearing at a younger age suggests that primary prevention, especially control of hypertension may be less efficient in poor neighborhoods. As the number of population per GP is similar in the 2 districts, the intensity of primary health care services can not be held responsible for this difference.

Epidemiology of stroke

Risk factors of subarachnoid haemorrhage in the population-based case-control, CHina Epidemiology Research In Subarachnoid Haemorrhage (CHERISH) study


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controls for analyses. In multivariate analysis, history of hypertension and cigarette smoking, were the most important modifiable risk factors. Multivariate-adjusted relative risk (RR) of hypertension was 2.81 (95%CI 1.81 to 4.36). Compared with non-smokers, the adjusted RR for SAH among current smokers was 2.28 (95%CI 1.34 to 3.87), but were higher in females (3.91; 95%CI 1.66 to 9.25) than in males (1.53; 95%CI 0.73 to 3.19). Population-attributable risks were highest for hypertension (32%) and current smoking (17%). Conclusions: Incidence of SAH is strongly related to common modifiable risk factors such as smoking and hypertension, which together accounted for about half of all such disease in this population.

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Antiplatelet drugs, warfarin and the risk of haemorrhagic stroke in the general population
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Background: Aspirin and clopidogrel, the most widely used antiplatelet drugs, are known to increase the risk of upper gastrointestinal bleeding close to twofold. The exact magnitude of any increased risk of haemorrhagic stroke (HS) remains unclear. We studied the relationship between use of antiplatelet drugs and warfarin and HS using data from a primary care database, The Health Improvement Network.

Methods: We conducted a case–control analysis nested in a population-based cohort. We used 1797 cases of intracerebral haemorrhage (ICH), 1340 cases of subarachnoid haemorrhage (SAH) and 10 000 controls selected from the study cohort using density-based sampling. Individuals were classified as current users of the study drugs if they were using the drug in the previous month. Unconditional logistic regression models were used to adjust for age, sex and calendar year (Model I), or age, sex, calendar year smoking, alcohol, body mass index, hypertension and health services utilization (Model II). Results: Data from Model II are discussed (for both models see Table). Use of aspirin only was associated with a slight increase in risk of ICH (OR: 1.18, 95%CI: 1.03–1.37), but not SAH (OR: 0.83, 95%CI: 0.67–1.03). Clopidogrel was not associated with increased risk of ICH or SAH. Use of dipyridamole, with or without low-dose aspirin, was associated with a ~two-fold increase in risk of HS. Users of warfarin alone experienced a greatly increased risk of ICH (OR: 2.82, 95%CI: 2.26–3.53), and a moderately increased risk of SAH (OR: 1.67, 95%CI: 1.15–2.43). The risk of ICH associated with warfarin was higher for users of high doses (8 mg/day – OR: 3.58, 95%CI: 2.10–6.10), or those with
Elevated international normalized ratio (INR) values (INR ≥ 4 – OR: 16.7, 95%CI: 4.53–61.49).

Conclusion: Aspirin is associated with a modest increase in risk of ICH, but not SAH. Warfarin users experienced a much higher risk of ICH with a marked dose effect and an increased risk of SAH.

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High prevalence of renal dysfunction in acute stroke patients in Sub-Saharan Africa: comparison with a French stroke unit.

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Background

In acute stroke patients, the prevalence of chronic kidney disease (CKD) is estimated around 25%. Although Sub-Saharan African (SSA) subjects undergo epidemiological and demographic transition, the association of renal function and stroke is poorly investigated in this population. In this study, we aimed to compare the prevalence of vascular risk factors (VRF) and renal function, in stroke patients hospitalised in a SSA hospital (Cocody University Hospital, Abidjan, Côte d’Ivoire) and in a French stroke unit (Amiens University Hospital, Amiens, France).

Methods

This retrospective study included all consecutive stroke patients admitted between January and May 2008 (Cocody University Hospital, Abidjan, Côte d’Ivoire) and between October and December 2008 (Amiens University Hospital, Amiens, France). We assessed each patient’s demographic details, VRF and computed tomography confirmed pathological stroke type. The glomerular filtration rate (eGFR) was estimated using the Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI) formula.
Background: Data on seasonal differences in stroke incidence are conflicting. Less is known about seasonal variability in stroke etiology.

Methods: The Ludwigshafen Stroke Study (LuSSt) is a prospective ongoing population-based stroke registry among the 167,906 inhabitants of Ludwigshafen am Rhein, Germany. Between January 1, 2006 and December 31st, 2010, all patients with residency in Ludwigshafen who suffered from acute stroke or transient ischemic attack (TIA) were consecutively registered. For the present analysis, only patients with first-ever stroke (FES) were included.

Results: 1779 patients suffered a FES. Mean age at stroke onset was 72.1 years (SD 13.2). Baseline data, stroke subtype, stroke etiology and risk factors according to season at stroke onset are depicted in Table 1. Stroke incidence per 100,000 person years was significantly lower during summer for FES (summer: 187.1 vs. autumn: 208.8 vs. winter: 224.6 vs. spring: 226.8;) (p=0.020) as well as for ischemic stroke (summer: 168.2 vs. autumn: 180.1 vs. winter: 196.2 vs. spring: 192.3;) (p=0.043) and intracerebral hemorrhagic stroke.

Conclusion
Although this was a hospital-based study, CKD appears to be very common in SSA acute stroke patients. These results warrant confirmation in prospective studies.

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Seasonal differences in stroke incidence and etiology
Results from the Ludwigshafen Stroke Study (LuSSt), a population based stroke register

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Results One hundred and ninety five patients were included (Amiens: 92; Abidjan: 103). French patients were significantly older (68 vs 59 years, p<0.001) and had more previously known VRF than African patients. In contrast, African patients had more VRF discovered during hospitalisation. More African than French patients had cerebral haemorrhage (34% vs 8%, p<0.001) but acute stroke mortality was similar in the two hospitals. Finally, almost 1/3 of acute stroke patients had CKD. CKD was more common in SSA patients than in French patients (43% vs 24%, p<0.001).

Conclusion
Although this was a hospital-based study, CKD appears to be very common in SSA acute stroke patients. These results warrant confirmation in prospective studies.

Results: 1779 patients suffered a FES. Mean age at stroke onset was 72.1 years (SD 13.2). Baseline data, stroke subtype, stroke etiology and risk factors according to season at stroke onset are depicted in Table 1. Stroke incidence per 100,000 person years was significantly lower during summer for FES (summer: 187.1 vs. autumn: 208.8 vs. winter: 224.6 vs. spring: 226.8;) (p=0.020) as well as for ischemic stroke (summer: 168.2 vs. autumn: 180.1 vs. winter: 196.2 vs. spring: 192.3;) (p=0.043) and intracerebral hemorrhagic stroke.

Conclusion
Although this was a hospital-based study, CKD appears to be very common in SSA acute stroke patients. These results warrant confirmation in prospective studies.
Background: There is limited number of European studies investigating the association between socioeconomic factors and secondary prevention for ischemic stroke (IS) or TIA. The relation to carotid stenosis is not well addressed. The aim was to investigate the impact of educational and income level and carotid stenosis on use of antithrombotic medication after first IS or TIA.

Methods: The WINGA registry contains records of all patients referred for carotid evaluation in the city of Gothenburg (Jan 2006-Dec 2007). First-line carotid examination is according to local guidelines done with ultrasound and the registry covers 96% of all carotid examinations in the city (population of 500 181). Patients with IS or TIA were included, atrial fibrillation or treatment with anticoagulants excluded. National census data on average level of education and income were used to divide the city in tertiles of high, medium and low education/income. Data with patient’s individual purchase of antithrombotic agents (ATC B01AC*) immediately (0-4 months), 1 and 2 years after the event were collected from official registries and used as an index of drug use.

Results: The study population (n=782, 52% male) consisted of 532 IS and 250 TIA cases. The frequency of carotid stenosis was 15%. Frequencies of individuals on secondary prevention with antithrombotic agents were 90.8, 78.1 and 72.3% immediately, 1 and 2 years after the event. No significant difference was found in the tertiles of education group (75.9-72.0% at 2 years) or income group (72.6% - 71.2% at 2 years). No difference were seen between men and women.
Background: Atrial fibrillation (AF) is the most common sustained cardiac arrhythmia. It’s effects on mortality, morbidity and healthcare costs are immense and broadly documented. One of its most dreadful complications is ischemic stroke (IS) resulting from a cardioembolic event. In this work the authors analyzed the data available from patients with AF admitted to a dedicated Stroke Unit.

Methods: One-center, retrospective study of 157 patients admitted to a Stroke Unit from January 1st 2009 to December 31st 2011, with a diagnosis of AF and IS/ transient ischemic attack (TIA). Analysis of patients’ background, risk factors, outcome, anticoagulation indication and status was performed. Data were collected through consultation of patient file, discharge letter and blood tests.

Results: Of the 157 patients in this study, 86 (55%) had known AF. Of these, 83 (97%) had formal indication for anticoagulation (according to CHA2DS2-Vasc criteria). However, only 34 (40%) were on oral anti-coagulants, and only 8 of these were on therapeutic range (INR 2-3), which means that only 9% of known AF patients had this risk factor controlled. The median age of our population was of 76 years old. We had also considered variables such as the Rankin Scale, the Oxfordshire Classification and several risk factors (tabagism, obesity, diabetes, obesity, dyslipidemia, alcohol abuse, hypertension, previous stroke, heart failure and ischemic heart disease) to reach conclusions.

Conclusions: AF is a common cause of IS. In our study Hypertension is the most common risk factor. According to the most recent evidence, this population had a very poor control of AF as a risk factor for IS/TIA. Nevertheless it is impossible to determine with an acceptable degree of certainty how many ischemic events could be prevented if more of these patients were well anti-coagulated.
Background and Purpose: Published data about stroke epidemiology in southern Iran are scarce. We tried to find the demographic, socioeconomic and mortality of patients with stroke in a referral center in south of Iran.

Methods: This was a hospital-based single-center retrospective longitudinal study performed in Namazi Hospital, Shiraz, south of Iran. Patients with the International Classification of Diseases, 9th edition–Clinical Modification (ICD-9-CM) codes of 160-169 was extracted from hospital database. Age, sex, inhabitation, coverage by charity insurance indicating for low socioeconomic status, length of hospitalization, discharge destination were investigated.

Results: 16351 patients, 8759(53.6%) males and 7592(46.4%) females, were recruited. Mean age of the patients were 63.4 (95% CI 63.1 to 63.6) years. 2326 (14%) patients were younger than 45 year old (young adult stroke). 428(0.026%) of patients were in the pediatric age group (equal or less than 18 year old. 2935 (19.95%) of the patients inhabited in rural areas and 13416 (80.05%) were form urban areas. 875 (5.35%) of patients were from very low socioeconomic status covered by charity insurance. Mean hospital stay was 6.3 (95% CI 6.2 to 6.4) days. Stroke hospital mortality rate was 20.5%, significantly higher in females, pediatric age group, patients from low socioeconomic status. (all P values <0.001). Mortality rate of the stroke patients was significantly increased from 2001 till 2009. (P value <0.001)

Conclusions: Stroke is a major health issue in Iran with higher mortality and larger proportion of young adults in comparison to western countries.

Keywords: Stroke, cerebrovascular disease, cerebrovascular accident, mortality, age, sex, Iran

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INFLUENCE OF DIABETES MELLITUS ON THE DEVELOPMENT OF IN-HOSPITAL COMPLICATIONS IN ACUTE ISCHEMIC STROKE PATIENTS.

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Background: it is known that patients with diabetes mellitus (DM) that undergo hospitalization are more likely to develop in-hospital complications (IHC). Besides, DM patients are thought to have a bad prognosis after an ischemic stroke (IS), although it has not been settled yet whether this could be due to a higher rate
of IHC. Our objective was to analyze if previous diagnosis of DM is associated to a higher risk of IHC after IS. Methods: observational study including consecutive patients with IS admitted to a Stroke Unit during 2007-2010. We compared demographic data, vascular risk factors, previous comorbidity (Charlson-Deyo Index), stroke subtype, stroke severity (National Institutes of Health Stroke Scale), capillary glucose levels on admission and IHC development between two groups: DM and non-DM patients. Multivariate logistic regression analyses were performed to identify predictive factors associated to IHC.

Results: 1137 patients. 283 (23.8%) had previous diagnosis of DM. These were elder and had higher comorbidity, with no differences regarding stroke severity. DM patients presented more often hyperglycemia on admission and suffered more frequently IHC (23.7% vs. 17.9%, p= 0.034), especially early neurological worsening (4.6% vs. 1.6%, p= 0.005) and renal failure (4.6% vs. 2.2%, p= 0.036) than non-DM. However, after adjusting for the baseline differences, previous DM was not independently associated to the development of IHC, whereas high glucose levels on admission (OR:1.014; IC 95%: 1.007-1.022; p<0.001) and stroke severity (OR:1.156; IC 95%: 1.107-1.208; p<0.001) proved to be the most important predictive factors for IHC.

Conclusion: Regardless of previous diagnosis of DM, high glucose levels on admission and stroke severity are the most determinant predictive factors for the development of IHC after an IS.

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Association between hemorrhagic transformation and blood pressure profiles before and after intravenous tissue plasminogen activator in the hyperacute ischemic stroke

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Objectives: The efficacy of intravenous tissue plasminogen activator (t-PA) has been established in the hyperacute ischemic stroke. In spite of its efficacy, spontaneous intracranial hemorrhage after t-PA is severe complication associated with the bad prognosis of patients. We evaluated the role of blood pressure (BP) and BP variability, which had been measured before and after injection of t-PA during 24 hours.

Methods: The 111 patients were enrolled. Blood pressure (systolic blood pressure [SBP], diastolic blood pressure [DBP], and pulse pressure [PP]) was recorded before t-PA and during 24 hours after t-PA at 1-hour interval. The blood pressure profiles were characterized by initial, mean, maximum (max), minimum (min), max-min, and standard deviation (sd). The intracranial hemorrhage after t-PA was assessed CT or MRI after 24 – 36 hours to t-PA. The hemorrhagic transformation was classified by using clinical and radiologic criteria as follow: hemorrhagic infarction, parenchymal hemorrhage, and symptomatic hemorrhage.

Results: The intracranial hemorrhage
ocurred as follow: hemorrhagic transformation (HT) 25.52% (n=25), parenchymal hemorrhage (PT) 10.81% (n=12), symptomatic hemorrhage (SH) 3.60% (n=4). The 24h-PPsd was significantly higher in the patients with HT (14.57±0.76 vs 11.84±0.39, 95% confidential interval [CI] 1.07 - 4.40, p<0.001) and PH (16.74±4.17 vs 11.93±3.48, 95% CI 2.65 - 6.97, p<0.001). The 24h-PPmax-min was similar trend to the 24h-PPsd in two groups: HT, 55.68±2.59 vs 48.02±1.79, 95% CI 0.53 - 14.79, p=0.04, PH, (93.42±16.40 vs 82.41±18.3, 95% CI 0.01 - 22.00, p=0.05)
Odds ratio per 5mmHg of 24h-PPsd was 2.41 (95% CI 1.23-4.72) in HT and 4.76 (95% CI 1.60 - 12.17) in PH.
Conclusion: The variability of pulse pressure during first 24 hours may be associated with the hemorrhagic transformation after thrombolytic therapy with t-PA.

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Higher blood glucose within the normal range is associated with more severe strokes
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Background: Higher fasting blood glucose (FBG) concentrations in the hyperglycemic range associates with more severe strokes. Whether this association also extends into patients with FBG in the normoglycemic range is unclear. We studied the association of stroke severity and FBG in normoglycemic patients with ischemic stroke median 7 days post stroke when the initial glycemic stress response has resolved.

Methods: Included were 361 non-diabetic ischemic stroke patients with admission fasting blood glucose within 70-130 mg/dL admitted into an acute stroke rehabilitation unit median 7 days post stroke. Data including, neuroimaging, vital signs, cardiovascular risk factors and Functional Independence Measure (FIM), were recorded prospectively.

Results: FBG correlated directly with stroke severity in the normoglycemic 70-130 mg/dL range (correlation coefficient -0.17; p = 0.003). Odds ratio for more severe injury (below average FIM score) was 2.02 for patients with FBG 110-130 mg/dL compared to patients with FBG 70-90 mg/dL (95% confidence interval 1.10-3.73, p = 0.022). Each mg/dL increase in FBG was associated with an average decrease of 0.25 FIM points. In a multiple linear regression model FBG was associated with more severe stroke (p = 0.002).

Conclusion: One week after ischemic stroke increasing values of FBG within the normoglycemic range were associated with increasing stroke severity. As blood glucose was measured at a time
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**Stroke physicians: is it the physician or the comprehensive system that makes the difference – a report of a prospective cohort study.**

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Background: Stroke care on comprehensive stroke units is the gold standard. While neurologists are often involved, other physicians with expertise and training in stroke care, termed stroke physicians also look after stroke patients.

Hypothesis: Stroke care delivered on a comprehensive stroke unit results in better outcomes irrespective of the physician responsible.

Methods: A single centre, prospective cohort study of ischemic stroke patients admitted between 2000–2011 was conducted. Analysis was stratified according to receiving care on general medical units (GMU) (2000–2004); stroke unit care where strokes were initially seen by a neurologist and transferred to a stroke physician (2005–2009), to a comprehensive stroke unit (CSU) model with stroke care under a single stroke physician led by a Stroke Director (2010–2011).

Results: When comparing GMU vs. CSU care there was a significant reduction in mortality (13.5% to 10.1%, \( P = 0.04 \)) discharge to an aged care facility (10.7% vs. 6.7%, \( P = 0.009 \)), a reduced mean length of stay from 12.7 to 10 days (\( P = 0.0001 \)), and a reduced relative- stay-index from 1.19 to 0.96 (\( P < 0.05 \)).

Conclusion: Better outcomes are seen using a CSU model of care even when these units are manned by non neurologist stroke physicians.

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**Cerebral thrombolysis in patients with acute ischemic stroke and chronic kidney disease.**

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Conclusions:
The presence of CKD has no influence on the safety and efficacy of cerebral thrombolysis regarding the mortality, functional outcome and presence of hemorrhagic complications.

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**Door to needle time: Universal target in minutes or case by case**

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**BACKGROUND:** Analysis of door to needle time in acute ischaemic stroke (AIS). There is general recommendation in stroke patient in UK to be thrombolysed within the 60 minutes of admission. However with availability and utility of multiple imaging methods to aid in decision making time taken in complex cases may be more then recommended. Same applies to time taken in consent in above 80 years of thrombolysis which is currently outside licences.

**METHODS:** We analysed the door to needle time (DTN) for 30 patients thrombolysed for AIS in Southend University Hospital between 01/06/2011 to 31/10/2011. Data collected include age, type of stroke, time of arrival to hospital and time of thrombolysis, door to CT time and scan to thrombolysis time.

**RESULTS:** 15 of the 30 patients (50%)
were thrombolysed within the recommended 60 minutes of door to needle time. Of the remaining 15 patients who had a DTN of more than 60 minutes, the overall median time was 85 minutes with a range of 64 to 260 minutes. 7 of the 15 patients were thrombolysed out-of-hours (beyond 0900 to 1700 hrs) when a member of the stroke team is unlikely to be present by telephone consultation with a stroke consultant. 5 patients were over 80 years of age with a median door to needle time of 99 minutes who needed a detailed consenting procedure as thrombolysing patients over 80 is not licensed currently. 4 patients needed additional imaging in the form of CT perfusion or CT angiography leading to delay in door to needle time.

CONCLUSION: One of the main reasons for delay in receiving thrombolysis was complex needs in term of consenting or complex imaging. We strongly advocate quick time in protocol based thrombolysis but universal DTN time window is difficult to be applied on anyone where above 80 who need detailed consenting and the patients who are in need of further imaging in the form of CTP or CTA. The protocol has been made to cut the time in these situations and will be reanalysed.

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Communicating thrombolysis risk in the emergency setting: findings from an ethnographic study
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Background: Despite thrombolysis being in routine use in clinical practice, a number of areas of uncertainty remain. The communication of thrombolysis risks and benefits is a little studied area and it is unclear how this is explained to patients and carers. This study investigated thrombolysis risk communication in the emergency setting.

Methods: We undertook an ethnographic study in 4 London hospitals conducting observations in both emergency departments and hyper-acute stroke units. We conducted over 200 hours of participant observation and 20 in-depth interviews with patients, carers and clinicians.

Results: Some clinicians were concerned with obtaining informed consent or assent from carers in providing thrombolysis. This was motivated by fear of complaints in the event of thrombolysis complications and by concerns about medico-legal implications. Other clinicians adopted a more ‘paternalistic’ approach describing thrombolysis as the most appropriate, safe and effective treatment for stroke. Patients had little, if any, memory of the emergency situation or thrombolysis discussions, even within 24 hours of admission. Carers reported stress and anxiety in the emergency situation and that thrombolysis information was complex to understand. They reported a willingness to trust and follow the advice of clinicians in thrombolysis treatment. Difficulties with information provision also included language barri-
Glycogenphosphorylase Isoenzyme BB (GPBB) – an early marker for ischemic stroke
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Background: In theory, biomarkers for ischemic stroke may be used for diagnosis, prognosis and treatment decisions as well as monitoring the clinical course. However, there are no sufficient blood tests for biomarkers available, so far. We investigated Glycophosphorylase isoenzyme BB (GPBB) which is an enzyme located in the brain and the heart. It is already well established as an early biomarker for acute coronary syndrome (ACS).

Analysis of a pilot study in ischemic stroke patients indicated GPBB to be elevated early after symptom onset. Therefore, we evaluated GPBB levels after ischemic stroke in 30 patients in regard to stroke severity including a kinetic analysis.

Methods: Serum concentration of GPBB was analyzed in n=30 stroke patients. Commercially available GPBB-ELISA for ACS patients was used. In AIS-patients, blood was drawn first within 6 hours after symptom onset and then measured twice daily for the first two days and then daily until day 6 or discharge. Neuron-specific enolase (NSE), Troponin I, Creatinkinase (CK) and CK-MB were measured daily. We assessed the severity of stroke by NIHSS (n=30) and lesion size in patients, who received an MRI on admission (n=8, a*b*c/2).

Results: A) GPBB was elevated in all AIS-patients within 6 hours after stroke onset (cardiac origin was ruled out: Troponin<0.5ng/ml, EKG and TTE: no signs of myocardial damage). B) GPBB levels on admission were 46.4+/-26.2ng/ml (normal <10ng/ml) and remained elevated throughout the study (fig.1). C) On admission GPBB levels differed between patients with low NIHSS score (NIHSS<4) and high NIHSSS (>/=4, fig. 2). D) Lesion size correlates with GPBB levels (correlation coefficient 0.83, fig. 3)

Other biomarkers of brain damage were also elevated; NSE-levels reached 40ng/ml, S100ß 6.5ng/ml. At first point of analysis only n=3 patients showed an elevated level of NSE and only n=1 patient for S100ß.

Discussion: GPBB is an early and spe-
Acute Medical Assessment Unit based Stroke Service: An effective model of Organised Acute Stroke Care.

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Background: Organised stroke services including care by a trained multidisciplinary team operating in a stroke unit have been shown to significantly improve outcome of people with stroke. Acute Medical Admission Units (AMAU) have shown similar benefits in the care of unselected medical patients. Both service models share important features e.g. a senior decision maker, vigilance for basic physiological parameters, emphasis on MDT working and provision of services on a 24/7 basis. Stroke patients frequently present with a combination of both medical and neurological problems and may therefore benefit from both models of treatment.

We instituted an organised stroke service within an AMAU with intent to develop a service benefiting from both models of care. The service includes specialist stroke trained medical, nursing and therapy staff, enhanced training of AMAU staff in stroke care, a discreet acute stroke unit area within the AMAU and a 24/7 thrombolysis service. We performed a study to determine the effect on stroke outcome of these changes.

Methods.

ICD 9 and ICD 10 data for all medically admitted patients admitted through the...
emergency department collected over a 6 year period were analysed and subjects with acute stroke identified. Annualised 30-day mortality for stroke was calculated for stroke patients.

Results:
20853 patients were admitted as emergencies between 1st January 2005 and 31st December 2010 of whom 1150 (5.5%) were stroke patients. The mean age of the stroke patients was 70.2 (SD 15.6), 53.8% were female and Median length of stay was 8 days (IQR 7.1 days). 30-day mortality dropped from 28.7% in 2005 to 11.1% in 2010 (61% relative reduction, Number needed to treat 5.2) following progressive institution of organised AMAU and stroke service care (figure)

Conclusion:
A model of organised acute stroke care within an Acute Medical Admissions Unit is an effective one and is associated with similar improvement in outcomes to other models of stroke unit care.

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Point-of-Care Laboratory Halves Door-to-Therapy-Decision Time in Acute Stroke
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Time until beginning of a causal therapy is critical for favorable outcome of acute stroke. In ischemic stroke treatment, application of rt-PA thrombolysis requires information about coagulation, blood count and liver laboratory parameters of the patient in order to reduce bleeding complications. Currently, stroke laboratory examinations are usually performed in the centralized hospital laboratory, which can be time consuming. Therefore, planned thrombolysis is often given before all results are available as off-label use. In this study, we examined the feasibility of gaining valuable time by transferring the complete stroke laboratory workup required by stroke guidelines to a point-of-care laboratory system, that is, placed at a stroke treatment room contiguous to the computed tomography, where the patients are admitted and where they obtain neurological, laboratory, and imaging examinations and treatment by the same dedicated team. Our results showed that reconfiguration of the entire stroke laboratory analysis to a point-of-care system were feasible for 200 consecutively admitted patients. This strategy reduced the door-to-therapy-decision times from 84 +/- 26 to 40 +/- 24 min (p < 0.001). Results of most laboratory tests (except activated partial thromboplastin time and interna-
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Background. Thrombolytic therapy is efficient in improving the long term outcome with the patients with the ischaemic stroke of less than 3 hours of evolution. Hyperglycaemia in the acute phase of the ischaemic stroke can be seen within 20% and 50% of the patients and could result from the stress, glucose intolerance or the unrecognized diabetes. Many studies have pointed out the connection between hyperglycaemia and the clinical outcome.

Purpose. Determination of the effects of the Post Insult hyperglycaemia on the mortality, functional outcome and the number of symptomatic haemorrhages with the patients who have had the ischaemic stroke and treated with fibrinolysis.

Results. We used the national database, open, observational multicentric studies following the efficacy and safety of the implementation of the thrombolytic therapy in Serbia (SETIS) within 2006-2010. 425 patients in 10 Health centres were analysed. Glucose levels were measured at the admission based on which the patients were divided into two groups – with normal and elevated glucose (over 6.1 mmol/l). Clinical outcome is correlated relating to the mortality, degree of the neurological deficit measured by NIHSS and functional deficiency Rankin scale. Average age was 58.2+/−12.7 (18-83). There were 38.8% women and 41% men. The mortality outcome was 14.7%. Average glycaemia on the admission was 6.6 mmol/l.

Conclusion. Elevated glycaemia values on admission correlate significantly with the degree of the neurological deficit, functional status, as well as fatal outcome. The correlation between the degree of development of the intracranial haemorrhages and early glycaemia rise has not been found.
disability. Imperial College Healthcare NHS Trust was successful in becoming one of the 8 London Hyper Acute Stroke Units (HASU), charged with providing 24hr access to thrombolysis and hyper acute specialist stroke care. Imperial College Healthcare NHS Trust set out to improve their door to needle times. Methods A ‘Door to Needle Stopwatch’ tool was developed by members of the team to monitor and audit current thrombolysis practices and to identify areas within the existing pathway which could be streamlined in order to reduce door to needle times. Nurses trained as part of the thrombolysis team helped implement the tool in order to identify in ‘real time’ any delays along each section of the process from the moment the patient enters the emergency room including immediate assessment, investigations, decision making and preparation of the thrombolysis medication. Results The stopwatch tool was implemented at the end of May 2011 and then the door to needle median time was 70 minutes. The launch of the tool produced a reduction of 28 minutes in the door to needle times in the first month alone. During the past seven months the times have continued to fall as pathway changes have been implemented in response to the information acquired from the tool. The median DtN time since September 2011 is 31 mins. Conclusions The development and implementation of a tool to improve door to needle times for the provision of thrombolysis has been very successful. Pathway changes include the bolus being given in CT and a unidirectional pathway to the HASU for the infusion, rather than returning to the ED. Radiographers now hold a thrombolysis bleep so that any delays in imaging are avoided. A dedicated staff member has been identified to monitor, record and report the thrombolysis door to need times and this has been a key aspect of the success of the tool in streamlining our service. Bolstering the weekend service is the next major step forward.

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The feasibility of using a scored Face Arm Speech Test as part of routine neurological observations for stroke patients.

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Background. Performance of neurological observations is part of the routine monitoring of stroke patients in the ED and ASU. Current neurological observations contain elements such as GCS and measurement of pupil size and reactivity neither of which is sensitive to changes in stroke severity or progression. The Face Arm Speech test (FAST) was originally developed to help lay recognition of stroke. It was designed to be performed rapidly (<30 seconds) on seated subject but its current form does not allow for gradation of clinical features. We developed a 0-10 point gradation based on NIH Stroke Scoring (Face Weakness: 0-3 points, Arm Weakness: 0-4 points,
Background: Thrombolysis (rtPA) is actually used in low percentage of patients with acute ischemic stroke admitted to an Emergency Department (ED). The objective of our study is to identify factors that interfere with rtPA treatment in Lombardia Stroke Unit (SU), in order to outline corrective interventions related to the ED phase.

Methods: An observational analysis of the data from the Lombardia Stroke Registry was performed. Acute ischemic stroke patients admitted to ED within 4,5
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Outcomes of stroke in London compared to other areas of England
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Background: London implemented a hub and spoke model for stroke care in 2010 for its 8 million person population, where all patients regardless of stroke type or time of onset were taken directly to one of 8 hyperacute stroke units. Additional funding was provided to hospitals meeting the predefined standards of care which included enhanced nurse- and therapy-to-patient ratios. Other areas of England developed their stroke services in various ways; some using telemedicine networks; some centralising care and others making little change. We report the differences in processes of care and mortality in London compared to the rest of England.

Methods: Hospitals across England contribute data to the Stroke Improvement National Audit Programme providing data on care for the first 72 hours. Patient records are linked to the Office of National Statistics for mortality at 3, 7, 30 and 365 days. Cox regression was used for survival comparison and logistic regression for the processes of care. All analyses were adjusted for age, sex, OCSP stroke classification and conscious level within the first 72 hours.

Results: The analysis is based upon 30,910 patients (6296 from London and 24614 elsewhere). Standards of care
Background Early (i.e. within 48 hours from admission) mobilization (EM) is a distinctive therapeutical intervention in stroke units, but in literature there is a small body of evidence about its effectiveness. The purpose of this study is to evaluate the impact of early mobilization on in-hospital survival and occurrence of adverse events.

Methods The analysis considers 9787 patients admitted in stroke units between January-December 2007 and January 2010- January 2011 with a diagnosis of ischaemic stroke. It has been related to in-hospital survival (primary outcome), and to the occurrence of in-hos-
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BAT-tling Stroke: The evolving role of the Brain Attack Team in Leeds General Infirmary (LGI)
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Background: The Leeds Teaching Hospitals (LTH) treats approximately 900 stroke patients annually. In order to maximise the thrombolysis rate in Acute Ischaemic Stroke, a Brain Attack Team (BAT) was created in October 2007 at one of its two main sites (LGI). The team initially consisted of a specialist nurse who is able to administer intravenous thrombolysis under the direction of a stroke consultant. The BAT was originally designed to assess acute stroke patients solely, and administer thrombolysis in those deemed suitable by the stroke physician. Here we look at the caseload referred to the BAT and its evolving role.

Methods: A prospective database of all patients referred to the BAT was collated over a 6 month period (February 2010-July 2010).

Results: In the 6 month period 172 patients were referred to the BAT. 87 Patients were female. Mean age was 70.4 years, with no gender differences. Only 68% of patients referred to BAT had a known time of symptoms onset. Of these 172 patients, only 111 had a diagnosis of stroke (65%) and 21 (12%) were thrombolysed. On arrival to hospital, 76 patients had either symptoms for greater hospital adverse events. The logistic regression model, corrected for age, gender, stroke severity, pre-stroke disability and, risk factors was developed to determine the impact of EM on in-hospital mortality and medical/neurological complications.

Results 66,8% (6536) of patients were early mobilized. Patients belonging to this group were significantly (p<0,001) more likely to have a history of hypertension, dyslipidemia, myocardial infarction, coronary heart disease, heart failure, peripheral arteropathy, valvular prosthesis, and a higher pre-stroke disability. This group was also characterized by a higher probability of in-hospital cardiovascular complications and falls (mostly if a history of cardiopathy or dementia was present). Thus, in this group we noted a higher standard of quality care, according to SPREAD guidelines. Early mobilization was significantly associated with better survival (OR 3,02, 95% CI 2,45-3,71).

Conclusions: In ischaemic stroke patients early mobilization is an independent predictor of good outcome in terms of survival at discharge. However, it could give rise to adverse medical events, suggesting the need of a strict surveillance during the procedure, at least with the patients at higher risk of complications.
Background and Purpose Telestroke equipped ambulances may provide prehospital examination of stroke patients and improve allocation, time management and identify patients eligible for thrombolysis. We aimed to examine whether telestroke ambulances are applicable for further validity and feasibility studies in prehospital stroke management.

Methods In a real-time ambulance stroke scenario, feasibility of the National Institute of Health Stroke Scale (NIHSS) assessment and quality of audio-video (AV) signal were tested using current wireless cellular communication technology during patient transport in the moving car. Two stroke actors were trained in simulation of right and left middle cerebral artery stroke syndromes. NIHSS assessment was performed by a hospital-based vascular neurologist via telemedicine, by a telemetrically guided emergency physician and “a posteriori” on the basis of video documentation.

Results In 18 out of 30 scenarios NIHSS assessment could not be performed due to absence or loss of AV signal. In the remaining 12 completed scenarios, interrater agreement of NIHSS examination between ambulance and hospital and “a posteriori” video evaluation was moderate to excellent with weighted $\kappa$-values of 0.69 (95%CI 0.51-0.87) and 0.79 (95%CI 0.59-0.87).

Conclusions: Since its inception, the BAT has become an integral part of our acute stroke management at LTHT. Our data suggest that the BAT is heavily relied upon as a diagnostic service for stroke and stroke mimic presentations. The evolving role of the BAT means that patients are now seen quicker by health professionals specialised in stroke management. A Stroke Consultant rota has been subsequently developed to complement the BAT and data for this will be forthcoming. Institutions wishing to develop a similar service should be aware of the potential evolution of service needs, training requirements and workload.

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Telestroke ambulances in prehospital stroke management – are they ready yet for clinical implementation?
T.G. Liman, B. Winter, C. Waldschmidt, P. Hufnagl, N. Zerbe, H.J. Audebert, M. Endres

Results In 18 out of 30 scenarios NIHSS assessment could not be performed due to absence or loss of AV signal. In the remaining 12 completed scenarios, interrater agreement of NIHSS examination between ambulance and hospital and “a posteriori” video evaluation was moderate to excellent with weighted $\kappa$-values of 0.69 (95%CI 0.51-0.87) and 0.79 (95%CI 0.59-0.87).
Data were collected from case notes, the hospital intranet, and by contacting the patient directly for follow-up. Baseline demographics and clinical findings, imaging results, procedural complications, National Institutes for Health Stroke Scale (NIHSS) score after 1 week, mortality and modified Rankin score (mRS) at 3 months where recorded.

Results: From December 2009 to November 2011 fifty-five patients (median age 67 years, median baseline NIHSS 17) were treated with EVT (thrombectomy alone 11, iv+ia lysis 11, iv lysis and thrombectomy 17, and Iv+ia lysis and thrombectomy 26). Revascularisation successful (TIMI 2 or 3) in 89%. The median time from stroke onset to successful thrombus retrieval was 6h 27 min. A good outcome (mRS 2 or less) at 90 days was achieved in 49% with a mortality of 11%. The main complications of the procedure were: vasospasm (22%), distal embolization (16%), pulmonary embolism (7%), groin hematoma (6%), deep vein thrombosis (4%), and device malfunction (2%). There were no symptomatic intracerebral hemorrhages.

Conclusion: Interventional treatments for acute stroke led to good clinical outcomes in 49% of patients with severe strokes. This considerably better than the natural course of stroke with comparable severity or intravenous thrombolysis.

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Outcomes following intra-arterial interventions for acute ischaemic stroke at University Hospital of North Staffordshire (UHNS)

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Introduction: Intra-arterial thrombolysis (IAT) and mechanical thrombectomy (MT) have potential to accelerate reperfusion in acute ischaemic stroke with large vessel occlusions. Data from patients undergoing intra-arterial procedures for stroke at UHNS was used to review outcomes and procedural complications.

Methods: All patients treated with acute endovascular interventions (intra-arterial thrombolysis, mechanical thrombectomy, or both) for acute stroke at the University Hospital of North Staffordshire, UK were entered into a prospective register.
**A qualitative study of patient and carer experience of acute stroke unit care**  
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Sheffield Teaching Hospitals NHS Foundation Trust, Sheffield, UNITED KINGDOM

**BACKGROUND**  
Stroke services have undergone significant changes following the introduction of hyper-acute care. This study aimed to explore the experiences of stroke survivors and their carers in the UK, in view of policy and practice changes that have taken place in recent years, to determine which features of stroke unit care contribute to their positive and negative experiences.

**METHODS**  
32 semi-structured interviews were conducted with patients and carers who had received care at seven UK centres, including several patients who had received thrombolysis. The interviews followed the patients’ journey from admission to discharge. Most of the stroke survivors and carers were interviewed together. The interviews were recorded and transcribed verbatim, and analysed using framework analysis.

**RESULTS**  
Themes emerged around time, availability of care, knowledge sharing and carers need for support. Awareness of the importance of time to treatment was generally attributed to the UK FAST campaign and some commented on the usefulness of its message. Participants described the process of receiving thrombolysis from a patient’s perspective, whilst others described the frustration they felt at not receiving thrombolytic treatment. The availability of care, particularly nursing care, influenced the satisfaction of participants and many clearly distinguished between dissatisfaction due to the attitude of staff as opposed to the availability of staff. Knowledge sharing between staff and the patient and their carer provided reassurance, but the timing of information provision needed to respond to the needs of the recipient.

**CONCLUSION**  
This data will contribute to the ongoing evaluation of stroke policy change and emphasise the need for appropriate stroke awareness raising tools, such as FAST. The results from this study will be used to inform a service development project with those centres involved in the data collection.
Repatriation from Hyper Acute Stoke Units: A London Stroke Unit’s Experience

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Background

The delivery of stroke services in the UK has changed dramatically since the publication of the National Stroke Strategy in 2007. Since July 2010 NHS London has used a “hub and spoke” model to provide expert diagnosis, acute assessment and prompt administration of thrombolytic therapy to patients across the capital, 24 hours a day. All suspected strokes within London are now treated at one of eight Hyper Acute Stroke Units (HASUs) for around 72 hours before being transferred to their local Stroke Unit (SU) for ongoing care.

The process of transferring patients early in an acute admission is obviously potentially hazardous. To ensure patient safety a Pan-London HASU transfer protocol was agreed prior to the network “going live”. This contains guidance about updating SUs on likely transfers and recommendations for safe discharge from a HASU. It includes optimal transfer times, the use of “early warning” scores to ensure patients are clinically stable, and suggested contents of medical and nursing handovers, including imaging and discharge summaries.

Methods

We audited transfers from London HA-...
SU to our SU over a two month period, looking at compliance with transfer protocol standards. 27 patients were eligible for inclusion.

Results
Transfers failed to comply in several key areas. We found 73% of patients were transferred with no verbal medical handover, 60% of patients were transferred outside of recommended hours, 30% arrived with no imaging, and 27% had no HASU discharge summary. 11% of transferred patients also had a non-stroke diagnosis on discharge from our unit.

Conclusions
The London model has been very successful at improving acute assessment and management of stroke patients, and in reducing mortality. It appears that the quality of transfers from the hyperacute setting requires some attention, in part due to the pressure on HASU beds. We need to develop this aspect of our care to ensure that unsafe transfer does not undermine success in other areas.

Effect of a TPA code on door to needle time and thrombolysis rate: An Iranian hospital experience.
Student Research Committee of Tabriz University of Medical Sciences, Tabriz, IRAN1, Neuroscience Research Center, Tabriz, IRAN2, Neuroscience Research Center, Tabriz, IRAN3, Neuroscience Research Center, Tabriz, IRAN4, Tabriz University of Medical Sciences, Tabriz, IRAN5, Tabriz University of Medical Sciences Tabriz,IRAN6,Tabriz University of Medical Sciences, Tabriz, 7, Student Research Committee of Tabriz University of Medical Sciences Tabriz, IRAN8, Student Research Committee of Tabriz University of Medical Sciences, Tabriz, IRAN9, Student Research Committee of Tabriz University of Medical Sciences, Tabriz, IRAN10, Student Research Committee of Tabriz University of Medical Sciences, Tabriz, IRAN11, Student Research Committee of Tabriz University of Medical Sciences, Tabriz, IRAN12, Student Research Committee of Tabriz University of Medical Sciences, Tabriz, IRAN13, Student Research Committee of Tabriz University of Medical Sciences, Tabriz, IRAN14, Student Research Committee of Tabriz University of Medical Sciences, Tabriz, 15

Background: Earlier administration of Intravenous tissue Plasminogen Activator (IV-tPA) for acute ischemic stroke results in better clinical outcomes. Therefore, an organized hospital system of acute clinical assessment and neuroimaging will likely avoid delays in IV-tPA administration.

Aim: To evaluate the effect of a TPA code on thrombolysis rate.
Methods: In a tertiary university hospital, a fast tract system (FTS) organized for AIS patients who were eligible for ITT. In a prospective study with 6 month duration, for any patient with acute stroke symptoms (according to Cincinnati stroke scale) less than three hours, TPA code was activated. Thrombolysis rate and door to needle time were compared to 6 month period just before FTS organization.

Results: During the first six month before FTS organization mean door to CT scan time was 91 min, door to needle time was 150 min and 16 patients (3.1%) were eligible for ITT. After FTS organization in the second six month period, TPA code was activated for 86 times with TPA was administers to 34 (39%) patients. The mean door to CT scan time was 23.2 min, door to needle time was 56 min. Three patients had pre hospital notification with mean door to needle time of 22.6 min (19-29 min).

Conclusion: FTS trough TPA code for AIS patients lowered the time needed for in-hospital investigations including CT scanning and lab analysis and improved the thrombolysis rate.

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Faster Access to Stroke Clotbuster with Advanced Ambulance Pathway
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BACKGROUND: Thrombolysis can prevent major brain damage after an ischaemic stroke as long as it is initiated early. Furthermore, the earlier thrombolysis is started, the more likely the patient is to achieve a good functional outcome. Reducing this ‘stroke-to-needle time’ is a priority. Since April 2010 we have implemented an Advanced Ambulance Pathway (based on the Bournemouth model) at the Royal Cornwall Hospital. The advanced pathway allows ambulance practitioners to deliver patients directly to the CT scanner, potentially saving time. This audit investigates whether this pathway has reduced door-to-needle time.

METHODS: All patients admitted to RCHT and who have received thrombolysis for acute ischaemic stroke since September 2008 up until December 2011 were included. Door to CT times and door to needle times are reported as median and interquartile ranges (IQR) comparing time periods pre- and post-advanced care pathway implementation.

RESULTS: Between September 2008 and December 2011, out of a total of 3131 patients admitted with acute stroke, 91 patients (3%) with acute ischaemic stroke were thrombolysed. The majority of patients arrived within the hours of 8:00-18:00. In line with national results the majority of patients were clinically improved (16% cured, 44% better or much better, 28% no change, 5% died due to large ischaemic stroke, no bleed, 1% died due to symptomatic intracerebral bleed and 7% were functional patients, who sustained no complications). Comparison of timings pre- and post-Advanced Ambulance Pathway implementation show median improvement
in door to CT scanning time from 35 (IQR, 25–40) to 17 minutes (IQR, 12–22) with the new pathway and reduction in door to needle time from median time 55 (IQR, 47–67) to 42 minutes (IQR, 32–60).

CONCLUSION: The Advanced Ambulance Pathway has improved timing with respect to CT scanning and administration of thrombolysis for patients following ischaemic stroke. Further modelling studies should evaluate whether expediting stroke lysis results improves patient outcome in comparison to extending the stroke lysis window.

**Use of a Two-Tiered Stroke Response System May Improve Stroke Care**

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Introduction: The Acute Stroke Team (AST) is a key component of most stroke centers. Many of the stroke codes that they respond to are stroke mimics or obvious non-stroke medical conditions. We explored altering our AST response paradigm to reduce non-stroke codes and better utilize resources. Our hypothesis was that a new stroke code response system would lead to more efficient care.

Methods: We collected data on stroke codes from 2008-2011 and assembled a multidisciplinary team to address the issue of stroke codes called for non-stroke patients. Various models for stroke code responses were discussed, and we implemented a two-level stroke code response (stroke code 1, stroke code 2).

Results: At baseline, more than 60% of the stroke codes (545 of 900) were for stroke mimics, many of which were obvious (hypoglycemia, seizures, medical-
Background: Although hemorrhagic transformation (HT) of acute ischemic stroke (IS) is frequent, it is difficult to predict individually. Best known risk factors are cardioembolic stroke, old age, early CT signs, white matter disease, fibrinolysis and antithrombotic therapy. The predictive value of other factors or bleeding risk scores is less known. We describe risk factors, association with medication and predictive value of a bleeding risk score in patients admitted to a neurology ward.

Methods: One-year data was retrospectively reviewed for potential predictors of HT in IS. The HAS-BLED score was calculated. Contingency tables with relative risk (RR), logistic regression with odds ratio (OR) and 95% confidence intervals (95%CI) were used to estimate the risk of HT. The predictive value of HAS-BLED was calculated using ROC curves.

Results: There were 199 patients (70.9% male, mean age 62.7 years), 157 with follow-up scans. HT occurred in 21 patients (13.4%; 95%CI 8.9-19.6). At univariate analysis, atrial fibrillation (AF) (RR=2.96; 95%CI 1.36-6.45), cardioembolism (RR=2.8; 95%CI 1.30-6.11), INR>3 (RR=7.00; 95%CI 1.25-7.00) and higher NIHSS at admission (p=0.005) were associated with HT. At multivari-
acute analysis AF (OR=4.73; 95% CI 1.28-17.5) remained significant. Anticoagulation after IS caused more HT (27.8%) compared to antiplatelet drugs, with or without venous thromboembolism prophylaxis (10.7%; p=0.044 and 0%; p=0.008). Anticoagulation before IS predisposed to HT more than antiplatelet or no antithrombotic drugs (p=0.009) but, after adjustment, AF was the sole independent risk factor. Classic risk factors, carotid stenosis, platelet count or previous vascular events didn’t significantly influence HT. Neither HAS-BLED nor its individual components showed predictive value.

Conclusion: As in previous studies, AF was associated with HT. Anticoagulants didn’t cause HT when AF was accounted for. HAS-BLED wasn’t useful in predicting HT on IS on recent anticoagulation.

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Pilot testing of a directed TIA pathway.
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Background. Risk of ischemic stroke after TIA may range from 5 to 20%, with highest risk immediately after TIA. Optimum TIA evaluation is under study: TIA walk-in clinics, hospital admission, or urgent care center evaluation. We devised a novel, expedited evaluation using an ‘observation bed’ approach.

Method. Our 970-bed academic medical center sees 200 TIA cases per year (2007 to 2010); average cost USD 200,000, average LOS 3 days. We devised an evidence bases 23-hour pathway to expedite vascular and cardiac imaging. Patient materials were devised to educate and communicate. Stroke team followed all patients and expedited testing. A ‘code TIA’ sticker was affixed to all orders to assure rapid response.

Result. The pathway was rolled out in August 2011 after extensive education of nurses in the TIA Unit, emergency, and imaging departments. In 3 months immediately prior to roll-out, we evaluated 94 patients; 3 months after roll out 56 patients. The average actual cost was USD 5,554 before, compared to USD 4,523 after roll out (savings 18%). Of the 56 patients, 20 (35%) converted to an admission for stroke or other disorder; 17 (30%) were discharged within 23 hours of admission; 15 (27%) were not considered for the pathway (physician preference) and 4 (7%) left against medical advice.

Conclusion. A directed TIA pathway, including extensive education efforts, order sets, patient materials and aggressive stroke team involvement yielded substantial savings. Further testing is needed to assure the pathway generalizes to a larger population. Outcome studies will be needed to assure stroke risk reduction.
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Intravenous thrombolysis in posterior versus anterior circulation stroke

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Background: Information about safety and efficacy of intravenous thrombolysis (IVT) in posterior circulation stroke (PCS) are scarce. There is no randomized controlled trial which compares safety and efficacy of IVT according to stroke territory. The aim of this study is to compare safety and efficacy of IVT in PCS versus anterior circulation stroke (ACS).

Methods: We analyzed 607 patients treated with IVT in period from February 2006 to October 2011. All patients are part of the ongoing, prospective, multicentre, open, observational study-SETIS, which assesses the efficiency and safety of thrombolytic therapy in Serbia. Outcome measures were favourable 3-month outcome (0-2 on the modified Rankin scale), death, hemorrhagic transformation of stroke (HT) and symptomatic intracerebral hemorrhage (sICH) according to ECASS III criteria.

Results: From analyzed patients, 82 (13.5%) had PCS. In comparison with ACS patients there was no difference in sex (65.9% in PCS versus 63.2% in ACS, p=0.85) or age (57+-12.4 in ACS, p=0.06 versus 59.5+-12.3 in PCS). There was no difference in baseline NIHSS scores between these two groups (13.6+10.4 in PCS versus 13.2+-4.9 in ACS), but patients with PCS had less often severe strokes (NIHSS score more than 15)- 23.4% versus 35.6% in patients with ACS (p=0.03). The patients with PCS had lower chance for occurrence of HT (7.4% in PCS versus 20.7% in ACS; OR=0.3[CI=0.13-0.72]), while there was no significant difference in occurrence of sICH (1.2% in PCS versus 3.6% in ACS, p=0.33). There was no difference in good outcome (59.3% in PCS versus 62.3% in ACS, p= 0.79) and death rate (17.9% in PCS versus 13.3% in ACS).

Conclusion: Patients with PCS had less often occurrence of HT in comparison with patients with ACS.

Admission to neurological intensive care unit reduces risk of rehospitalization of patients with acute stroke

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Background-Stroke units have shown a decrease in mortality, institutionalization and disability compared to treatment in the wards. Our objective was to assess the impact of stroke treatment administered in the neurological intensive care unit (NICU) versus general intensive care unit (ICU).

Methods-We evaluated retrospectively hospitalized patients in which the diagnosis of stroke was established within less than 48h of evolution.
This assessment was performed during a year before and after the implementation of a neurological intensive care unit at a General Hospital in Brazil. Demographic data, NIHSS, TOAST mechanism, risk factors, treatment administered within the first 24h after admission, as well as the outcomes of death, disability and re-admission in six months were collected through a review of medical records. Results—Were included in the analysis 214 patients in NICU and 37 patients in the ICU. The female gender was predominant in the ICU; the severity according to the NIHSS was similar between the groups 7.6 (+/- 4.9) in the ICU and 8.2 (+/-7.5) in the NICU. The time door to neurologist was lower in the NICU 117.5 (+/-203) minutes versus 657(+/-589) minutes in the ICU p < 0.001. Our data showed that the use of anti-hypertensive drugs (33.8 % versus 59.3 % p 0.003) was lower and the use of antiplatelet (78.4 % versus 59.5 % p 0.02) and low molecular weight heparin (84.5 % versus 70.3 % p 0.03) was higher in the NICU. The rates of hospital readmission were significantly lower after hospitalization in NICU (9.8 % versus 35.1 % p 0.001). The multivariate logistic regression analysis showed that the early use of antiplatelet agents (OR 0,3 CI 95% 0,15 - 0,85 p 0,02) and the time door to neurologist less than 60min (OR 0,1 CI 95% 0,03-0,34 p < 0,001) were the determinants of lower risk of rehospitalization. Conclusions—NICU is associated with the best care in acute phase of stroke such as smaller time door to neurologist, lower use of antihypertensive drugs and early use of antiplatelets and low molecular weight heparin. Early use of antiplatelets and the shorter time door to neurologist were associated with a lower risk of rehospitalization in 6 months.

<table>
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<tr>
<th>VARIABLES</th>
<th>OR</th>
<th>CI 95%</th>
<th>p</th>
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<td>Antiplatelet in the first 24h</td>
<td>0.3</td>
<td>0.151 – 0.853</td>
<td>0.02</td>
</tr>
<tr>
<td>Door to neurologist &lt; 60min</td>
<td>0.114</td>
<td>0.038 – 0.342</td>
<td>&lt; 0.001</td>
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Orolingual angioedema associated with alteplase treatment of acute stroke

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Introduction:
Orolingual angioedema has been increasingly recognized as a potentially life-threatening complication associated with alteplase treatment of acute ischemic stroke. It is attributed to an anaphy-
lactoid reaction resulting from plasmin activation of bradykinin and complement pathways. An increased risk was reported in patients concomitantly being treated with angiotensin converting enzyme inhibitors (ACEi) and in those with insular ischemia.

Methods:
We reviewed all cases of orolingual angioedema among the patients undergoing recombinant tissue plasminogen activator (rt-PA) thrombolysis in our Stroke Unit. We also reviewed all cases described in the medical literature using MEDLINE electronic search.

Results:
Among 103 patients given rt-PA (alteplase) for acute stroke, 4 had orolingual angioedema, which developed during the first hours after alteplase infusion. The clinical picture varied from localized hemilingual or labial edema to extensive orolingual edema with respiratory distress and vomits. Depending on the severity, it was only applied ice or it was administrated a therapeutic scheme including antihistaminics, steroids and adrenaline, with complete remission during the following 48 hours. Three of the patients had a middle cerebral artery territory infarction, whereas the other one had a right superior cerebellar artery stroke. Only two of these patients were taking an ACEi.

In the medical literature, we found 49 cases of orolingual angioedema associated with alteplase. The reported incidence ranges between 0.9 and 5.1%.

Conclusion:
Orolingual angioedema occurred in 3.9% of the patients treated with rt-PA in our Stroke Unit, which is a result similar to those described in the literature. This is a potential complication of which treating physicians need to be aware. It is important to define international guidelines concerning the management of anaphylactoid reactions in association with alteplase.

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CAN WE IDENTIFY PATIENTS WHO WILL NOT RESPOND TO INTRAVENOUS tPA AT THE VERY EARLY STAGE?

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of neurology, Université Paris Descartes Sorbonne Paris Cité, INSERM UMR S894, Centre Hospitalier Sainte Anne Paris, FRANCE6, Department of neurology, Université Paris Descartes Sorbonne Paris Cité, INSERM UMR S894, Centre Hospitalier Sainte Anne Paris, FRANCE7, Department of radiology, Université Paris Descartes Sorbonne Paris Cité, INSERM UMR S894, Centre Hospitalier Sainte Anne Paris, FRANCE8, Department of neurology, Université Paris Descartes Sorbonne Paris Cité, INSERM UMR S894, Centre Hospitalier Sainte Anne Paris, FRANCE9

Background: Endovascular therapies are now more widely used in combination with intravenous (IV)-tPA in patients with acute ischaemic stroke. In order to select the best candidates for additional endovascular therapies, it would be crucial to identify patients who will not respond to IV-tPA at a very early stage. Several studies have identified factors associated with clinical response 24h after IV rt-PA but little is known about potential predictors within the first hour of treatment.

Objective: To identify clinical and radiological factors associated with no clinical response within the first hour after IV rt-PA in patients thrombolysed ≤4.5hrs after stroke onset.

Methods: We reviewed clinical and radiological data of 184 consecutive patients thrombolysed by IV-tPA only. Risk factors, concomitant medications, and clinical data were routinely collected in a standardized medical chart. The absence of very early neurological improvement (VENI) was defined by ≤40% reduction in NIHSS score at the end of the IV rt-PA treatment.

Results: At admission, brain MRI was performed in 173/184 (94%) patients. Mean age was 68.9 ±4.4, median NIHSS at admission was 15 (IQR 8-20). At the end of IV rt-PA, 121 (72%) patients had no VENI. Patients without VENI were more likely to have a ≥120 min stroke onset to treatment time (OR=3.42; 95%CI 1.63-7.21, p=0.001), a higher NIHSS score at admission (OR=1.09; 1.03-1.15 per 1-point increase, p=0.003), and a proximal carotid occlusion (OR=2.56; 1.10-5.95, p=0.03). Multivariate analysis showed similar results (data not shown).

Conclusion: Clinical and radiological data easily available at admission in patients treated by IV rt-PA are of little help to identify very early bad responders. There is a need to identify other very early radiological or biological predictors of response to IV rt-PA therapy that could help select good candidates for bridging therapy and guide organization of care.

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The influence of time from symptom onset on urgency of thrombolytic treatment in stroke
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Background: Extension of time window for intravenous thrombolytic treatment of ischemic stroke from 3 to 4 ½ hours from symptom onset brought the question of possible reduction of urgency of treatment and therefore loss of benefit from thrombolysis. The aim of the study was to assess the urgency of thrombolysis service in University Hospitals Coventry and Warwickshire (UHCW), depending on time from onset of stroke symptoms.

Methods: Analysis of all patients with ischemic stroke thrombolysed in UHCW between January 2009 and December 2011, including assessment of onset-to-door (OTD) and door-to-needle (DTN) times, using FAST audit sheets.

Results: Overall, 267 patients were thrombolysed. Mean OTD was 69, 81 and 90 mins in 2009, 2010 and 2011 (median: 60, 68 and 91 mins). Mean DTN was 83, 69 and 67 mins respectively. There was no correlation between door-to-needle time and onset-to-door time in any of the analyzed years (Pearson’s r=0.09; 0.07 and -0.09 respectively).

Conclusions: With proper organization and gaining experience in thrombolytic treatment of stroke, reduction of DTN can be obtained despite the time from symptom onset and remaining to treat.

Does extending the time window for stroke thrombolysis reduce treatment urgency and jeopardise the potential population benefit?

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Background:
The benefits of intravenous alteplase (rt-PA) treatment for acute ischaemic stroke up to 4·5 hours after onset have been demonstrated in pooled analyses despite current marketing approval for up to 3 hours. However, if extending the time window reduces treatment urgency, this could reduce or negate the population benefit of any extension since patient benefit is critically time dependent.

Methods:
We developed a Monte-Carlo simulation to model rt-PA treatment up to 4·5 hours from onset and assess the impact from changes in hospital treatment times.
associated with extending the treatment time window. Data for 3830 UK patients registered between 2005-2010 in the SITS-ISTR was used to parameterise the model. 

Results: 
We observed a significant relation between time remaining to treat and time taken to treat in the UK SITS-ISTR dataset after adjustment for censoring. The simulation showed that as urgency reduces due to a less imminent treatment deadline, an increasing number of patients are treated at a progressively lower absolute benefit to a point where the population benefit from extending the time window is entirely negated.

Conclusions:
Our model critically demonstrates the importance of maintaining treatment urgency for rt-PA treatment regardless the imminence of the treatment deadline. Despite the benefit to individual patients treated up to 4.5 hours after onset, the population benefit may be reduced or lost altogether if extending the time window results in more patients being treated but at a lower absolute benefit.

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Factors effecting blood glucose level in hyperacute ischemic stroke. Is mismatch a contributing factor?
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Background: Hyperglycemia is detected in 50% of acute stroke patients admitted to the emergency room (ER). Most of these patients don’t have diabetes mellitus (DM). This study examined the relationship between the existence of mismatch or ongoing proximal vessel occlusion (PVO) and admission blood glucose (ABG) level of patients in the first 12 hours of stroke.

Method: The files of the 212 patients admitted to the ER of Florence Nightingale Hospital in the first 12 hours of acute stroke, between years of 2006-2009 were examined retrospectively. Mismatch was determined with the comparison of admission diffusion and perfusion MRI and PVO was determined with MR-angiography. ABG was categorized as high (glucose > 140 mg/dl or <140 mg/dl) vs. normal according to cut-off level of insulin treatment. Correlations between existence of mismatch or PVO and ABG level were analyzed with multivariate logistic regression analyses. Age, gender, NIHSS, level of consciousness and other potential correlates of blood glucose level (stroke type, stroke etiology, DM history, Hba1c level) and treatment for diabetes were included in the analyses.

Results: The sample consisted of 212 individuals (124 men and 88 women). Mean age was 70 (SD:13). Mean ABG level was 137 mg/dl (SD:44). One hundred and six individuals (%55) had mismatch and one hundred and twenty-six individuals (%67) had PVO. Existence...
Mrs. C., aged 84, was found with global aphasia and right hemiplegia, near a shopping center. The time of stroke onset was not known and none eyewitness was present. A passer-by found the patient sitting on a bench with a hemiplegia and called firefighters at 11:40. Our service was called for “thrombolysis alert”.

Discussion:
It’s impossible to know who is the last person who saw the patient neurologically normal. So we try to know if Ms. C was doing some shopping before the deficit. A shopping bag is near to the patient. In this one, we find a receipt and a credit card’s ticket. The hour indicated on this is 11:21 am, what means that at this time, the patient had no neurological disorder. Indeed, she was able to correctly enter the code for credit card. We therefore consider that the start time is 11:21 am. After an MRI confirmed left MCA AIC, the patient is thrombolysed at 01:00 pm, one hour and thirty-nine minutes after stroke onset.

Conclusion:
Without any eyewitness of the beginning of the neurological deficit, the investigation to know the stroke onset must be very meticulous. All elements with time indicating must be considered. The receipt of credit card is an example.
Knowledge about the stroke symptoms and emergency procedures in northern Poland.

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Background: Pre-hospital delays are the main barriers to the implementation of intravenous thrombolysis in Poland. The majority of patients call the emergency medical services with a significant delay from the stroke onset. However, the reasons for delaying in calling the ambulance have not been studied to date in Poland.

The aim of our study was to evaluate the knowledge about the stroke symptoms and emergency procedures among Polish society.

Materials and Methods: The representative population of 1000 randomly selected adult inhabitants of Pomeranian Province were interviewed by telephone with a multi-choice questionnaire concerning stroke reasons, symptoms, emergency procedures and risk factors.

Results: Only 7.8% of respondents recognized stroke as a vascular disease but 97.1% of them found necessary calling the ambulance after the symptoms onset. Motor deficit was recognized as a symptom of stroke by 47.5% of respondents, speech disorders by 26.6% and face asymmetry by 8%. However, 91.2% of respondents indicated that patient with stroke should be admitted to hospital within 3 hours time window from the stroke onset and 73.9% of them were aware that stroke can be effectively treated. Hypertension was indicated as a risk factor for stroke by 89.4% of respondents, diabetes mellitus by 59.9% and cigarette smoking by 81.6%.

Conclusion. Insufficient knowledge about the symptoms of stroke, but not the stroke emergency procedures, is the main reason for delaying in calling the emergency medical services in acute phase of stroke.

Factors affecting the decision of tissue plasminogen activator thrombolysis for acute ischemic stroke. Analysis of intra-hospital variation. -Who is to blame?-

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Background
Tissue plasminogen activator (tPA) is the
only proven therapy to ischemic stroke. However, less than 10% of ischemic stroke patients receive tPA, mainly due to late arrival. In addition, only a small percentage of eligible patients receive thrombolysis due to several reasons. There have been several reports explaining inter-hospital variation in tPA use. However, it is hard to find the paper focusing the intra-hospital variation in tPA use.

Methods
Retrospective analysis of data from a hospital-based registry between 2006 and 2011. Various demographics regarding both patients and physicians, patient condition and insurance status were recorded. Both univariate (paired t-test, frequency test) and multivariate (logistic model) methods were used for finding factors which can influence the decision of tPA use. For analyzing data, Stata software was used.

Results
Out of 1,315 patients with acute ischemic stroke, 141 patients (10.7%) arrived within 3 hours. Absolute contraindications were found in 51. Thus, 90 patients (6.8%) were classified as eligible for thrombolysis. The mean age was 66.5 years, 61.1% were male, and initial modified Rankin Scale (mRS) score was 3.7. Out of 90 patients, 37 (41.1%) received tPA. There was no difference in the rate of tPA use in terms of patient age (P=0.4273) and sex (P=0.2561). Patients receiving tPA had higher initial mRS scores (4.0 versus 3.5, P=0.0292). There was no difference in the rate of tPA use based on insurance status (P=0.5973). There was significant difference in the expected frequency of tPA use in terms of physicians (Pearson chi-squared test, P<0.001). In multi-variate analysis, initial mRS score (OR=2.26, P=0.025), age of the physician (OR=0.86, P=0.028), and physician’s trained hospital (P=0.009) can affect the decision of tPA use.

Conclusions
Not only patient-factor but also physician-factor may influence the likelihood of tPA use. We need to take more interest in physician factors in regard to tPA use.

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The use of the Face-Arm-Speech-Time test when identifying stroke in an emergency call to the Emergency Communication Center
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Background:
To improve and facilitate the pre-hospital identification of acute stroke, the Face-Arm-Speech-Time test (FAST)
was introduced in a randomized study in Stockholm, Sweden, in 2008. The objective of the Hyper Acute Stroke Alarm study (HASTA) was to study the effect of a higher pre-hospital priority in acute stroke. Thus, identification from the Emergency Medical Communication Center (EMCC) was a crucial issue.

Methods:
FAST was used by the EMCC in emergency calls when deemed useful. Patients with at least one FAST symptom or otherwise suspicion of stroke were included in the study. The results from the EMCC was analyzed and correlated to final diagnosis at discharge from hospital.

Results:
A final diagnosis of stroke/TIA was found in 53% of the 942 patients included. At least one positive FAST symptom was noted in 64% of the 942 patients and of these, 57% were stroke/TIA.
Facial weakness was positive in 15%, negative in 20%, unclear in 30% and 35% missing. Stroke/TIA diagnosis was found in 64% of patients with positive facial test, 45% in negative and 50% in unclear answers respectively.
Arm weakness was positive in 23%, negative in 16%, unclear in 27% and missing in 34%. Stroke/TIA diagnosis was found in 65% of patients with positive arm tests, 47% in negative and 43% in the unclear, respectively.
Speech disorders were positive in 42%, negative in 14%, unclear in 13% and missing in 31%. Stroke/TIA diagnosis was found in 57% of patients with positive speech tests, 46% in negative and 40% in the unclear, respectively. The probability of a stroke/TIA diagnosis increased with the number of positive FAST symptoms, 50% when one, 65% when two, and 80% when three symptoms were noted.

Conclusion:
Speech disorder was the most common positive FAST symptom noted followed by arm weakness and at then facial weakness. As many as 30% of facial- and arm symptoms noted as with “unclear”. By testing all FAST items the identification from the EMCC might be improved.

Rapid Intervention with GTN (Glyceryl Trinitrate) in Hypertensive Stroke Trial (RIGHT): Determining the potential of ambulance-based randomised controlled trials in patients with ultra-acute stroke
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Poster Session Blue

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Background: Only one small uncontrolled trial of paramedic delivered treatment in patients in the ultra acute phase of presumed stroke has been reported. The practicalities of recruiting, consenting, randomising and treating such patients in the ambulance environment remain unclear.

Methods: RIGHT was an ambulance-based, single centre, single-blind, randomised controlled trial with blinded outcome assessment. The trial determined the feasibility of using the ambulance services to deliver ultra-acute (<4 hours) randomised treatment involving transdermal glyceryl trinitrate (GTN) or control (gauze dressing) assessed as effect on blood pressure at 2 hours and functional outcome at 90 days. Initial consent, randomisation and treatment was delivered by paramedics prior to hospitalisation.

Preliminary Results: 41 patients were randomised over 22 months (with 33 completing follow-up at day 90 to date): mean age 76.0 (11.0, standard deviation) years, female 44.7%, hypertension 63.2%, hypercholesterolaemia 31.6%, atrial fibrillation 21.1%, previous stroke 28.9%. Mean baseline FAST score was 2.59 (0.49), Scandinavian Stroke Scale at 2 hours 35 (17.0), and median time to randomisation 65 minutes from stroke onset. Systolic BP was 172.5 (30.4) mmHg at baseline and 163.3 (25.3) mmHg at 2 hours. The final diagnosis was: ischaemic stroke 26 (63.4%), primary intracerebral haemorrhage 6 (14.6%), TIA 4 (9.75%) and non stroke/TIA 5 (12.2%). 75 paramedics (11 ambulance stations) were trained, and 5 paramedics each recruited 3 or more patients. The effect of GTN on blood pressure and final functional outcome will be available in May 2012 for ESC.

Conclusion: The trial has confirmed that paramedics can successfully identify, recruit, consent, randomise and treat patients with ultra-acute presumed stroke in the ambulance environment. Only a minority of patients had non-stroke. Future agents without haemostatic activity could be tested ultra-acute after stroke in the ambulance environment.
but they also exhibit more often the three stroke symptoms (44.4% vs. 16.2%). After adjusting for age, sex and number of symptoms, the risk of a more severe post-stroke Rankin is not significantly different among patients using the SC call (OR=2.9; 95%CI: 0.8-10.2). Conclusion: Criteria for accessing the SC are actually very restrictive. Although SC is activate in case of more severe patient’s conditions, preventing the application of fibrinolysis, the proportion treated is relatively high in comparison with other studies. Supported: FCT/FEDER PIC/IC/82858/2007

Hemorrhagic transformation in acute ischemic stroke and functional outcome
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Background: Hemorrhagic transformation (HT) in ischemic stroke (IS) is common, but reported frequencies vary widely. While frequently asymptomatic, it may cause deterioration and impair outcome. HT after fibrinolysis has been well studied, but there are fewer reports on non-fibrinolysis. We describe HT rates, association between HT, stroke subtypes and fibrinolysis, as well as functional outcome in patients in a neurology ward. Methods: Data from IS patients admitted over a year was retrospectively re-
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The use of Face-Arm-Speech-Time test in the ambulance when identifying stroke

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Background:
The Face-Arm-Speech-Time test (FAST) was used in the randomized study, Hyper Acute Stroke Alarm (HASTA), in Stockholm, Sweden, in 2008. The objective was to study the effect of a higher pre-hospital priority in acute stroke and FAST was introduced to facilitate identification in the pre-hospital setting.

Methods:
Patients with at least one FAST symptom or otherwise suspicion of stroke were randomized either at the Emergency Medical Communication Center (EMCC) on the phone or at the ambulance after examination at scene. The results were analyzed and correlated to final diagnosis at discharge from hospital.

Results:
In 25% of included patients the stroke diagnosis was suspected first by the am-
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Management of patients treated with intravenous rt-PA during the last six years in the intensive care stroke unit of the Salpêtrière hospital.

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Background:
The management of acute stroke patients has changed since the European approval of rt-PA in 2003. We will present the experience of the intensive care stroke unit (ICSU) of the Salpêtrière over the past 6 years.

Methods:
Since January 2006, the unit has developed a database which lists the characteristics of all patients admitted in the ICSU. This database is updated daily in order to monitor on real time the activity and the quality of care of the unit. Here, we will focus on the patients treated by rt-PA during the 2006-07, 08-09, and 10-11 periods.
Results: During these 6 years, 2712 patients were admitted in the ICSU, and 28.4% had an < 5 hours ischemic stroke (n=770). 49% of them were treated by iv rt-PA within a 4.5 h time-window (n=377), after MRI in 96% of the cases. A 39% increase in number of thrombolysed patients occurred during the past 2 years (154 as compared to 112 and 111 in the 08-09 and 06-07 period). The NIHSS and median age peaked during the 08-09 period: 18/75 years vs. 17/69.4 in 06-07 and 15/69.6 in 10-11. The proportion of octogenarians increased: 21, 31 and 30.5% in 06-07, 08-09, 10-11. The median onset to treatment time remains almost unchanged: 174, 179, and 170 min. Symptomatic hemorrhage rates were 5.4, 6.3 and 9.7%. In-hospital mortality rates were 14.7, 18.8, and 14.6%. Independence rates at discharge (mRs 0-2) were 24.9, 18.8, and 32.8%.

Conclusion: Over the 6 years period the number of rt-PA treated patients increased as well as the proportion of octogenarians, but treatment delay was not improved. The fluctuations in mortality and independence rates are consistent with age and stroke severity variations, although they may reflect statistical fluctuations, as the high rate of symptomatics hemorrhages during the past two years, which is nevertheless unexpected and disturbing, although MRI is more sensitive than CT to detect hemorrhagic changes and is increasingly used in our center to explore deteriorating patients.

Clinical manifestations of ischemic stroke patients with spontaneous cervicocephalic arterial dissection arriving within 4.0 hours after onset.
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Background: It is often difficult to identify spontaneous cervicocephalic arterial dissection (SCAD) in ischemic stroke patients during the hyperacute phase. The usefulness of iv rt-PA for SCAD remains unestablished. Our purpose was to clarify the clinical manifestations of ischemic stroke patients with SCAD visiting within 4.0 h after onset, the timing while iv rt-PA within 4.5 h is practicable.

Methods: Consecutive ischemic stroke patients with SCAD admitted to our hospital within 7 days after onset were retrospectively enrolled. Clinical characteristics, sites of SCAD, and outcomes were compared between two patient groups divided according to the onset-to-arrival time (Group A; \( \leq 4.0 \) h, Group B; >4.0 h). Clinical profiles of SCAD patients receiving iv rt-PA were also investigated.

Results: Group A consisted of 21 patients (38%, 13 men, 49±13 years) and Group B of 34 (22 men, 49±14 years). Patients in the Group A had a higher initial NIHSS score [median 5 (IQR: 2.5 – 8.5) vs. 2 (1 - 7), \( P=0.042 \)] and modified Rankin Scale (mRS) score at 3 months [1 (0.5 - 2) vs. 1 (0 - 1), \( P=0.037 \)] than those in the Group B. The ACA dissection was more
common in the Group A (33%) than in the Group B (9%) after adjustment for sex, age, and initial NIHSS score (OR 5.9, 95% CI 1.32 – 33.55, P=0.020). Three patients received iv rt-PA without being noticed as having SCAD on the initial MRA due to arterial occlusion without dilative change; one had the SCAD in the ACA, one in the M1, and the other in the M2. Although aneurysm formation was identified in one patient during the acute phase, there was no subarachnoid hemorrhage or neurological deterioration. The mRS scores at 3 months were 1, 4, and 4, respectively. Conclusion: Thirty eight % of ischemic stroke patients with SCAD visited our hospital within 4.0 h after stroke onset, and 3 of them underwent iv rt-PA. Patients with the ACA dissection seem to have high chance of visiting within the eligible time window for iv rt-PA.

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Endovascular treatment of distal internal carotid artery occlusions with retrievable stents

Background. Acute stroke due to distal intracranial internal carotid artery occlusions (so-called carotid-T) has a poor natural history. Moreover, recanalization rates with intravenous rtPA are low. Methods. Data from a prospective register of patients with acute stroke treated with endovascular procedure in a single centre between 2009-2011 were analysed. Results. A total of 15 patients with carotid-T occlusion were collected (mean age 58+/−13, 53% male). Basal NIHSS was 18. 7 cases (47%) received previous intravenous rtPA. Median time from stroke to recanalization was 330 minutes. Retrievable stent with proximal occlusion and aspiration was used in all cases. 73% of procedures were performed under monitoring or conscious sedation. Complete recanalization (TICI 2b/3) was accomplished in 80% of cases, and symptomatic haemorrhagic transformation occurred in 1 case (6.7%). Cardiac embolism was the etiology in 80%. Favourable clinical outcomes (mRS 0-2) were achieved in 9 patients (60%). Mortality occurred in 2 cases (13%). There were no differences between patients who received intravenous rtPA previously or who underwent endovascular treatment directly, regarding time from stroke to treatment (333 vs 362 min, p=0.7), recanalization (TICI 2b/3a in 85% vs. 75%, p=0.5), duration of the procedure (71 vs 78 min, p=0.79) and median number of device passes (2.0 vs 2.2, p=0.69). We observed a trend for a better outcome (mRS 0-2 in 71% vs 50%, p=0.39) in the group of patients treated with intravenous rtPA previously compared to mechanical treatment alone. Conclusions. Endovascular treatment of carotid-T occlusions is safe and effective. Prior intravenous rtPA does not seem to modify technical success of the
mechanical treatment, but it may improve the outcome. Larger and randomized studies are necessary to confirm these preliminary data.

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**AUTONOMIC DYSFUNCTION IN DIFFERENT SUBTYPES OF ISCHEMIC STROKE**


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Background: Central autonomic impairment due to acute cerebral infarction is known to lead to excessively high blood pressure and tachycardia. The mechanism by which these symptoms occur in patients with ischemic stroke has not been elucidated.

Objectives: This study sought to investigate cardiovascular autonomic function in patients with different subtypes of ischemic stroke.

Methods & Patients: 77 ischemic stroke patients [50 ones with large-artery disease (LAD) and 27 ones with small-vessel disease (SVD), average six months after stroke onset] and 37 elderly controls were recruited. All performed Ewing’s battery autonomic function tests.

Results: From Ewing’s battery of autonomic function tests, atypical, definite or severe autonomic dysfunction were identified in 82.0% patients with LAD and 63.0% with SVD, with a borderline significant difference between the two groups (p=0.064), and the prevalence of autonomic dysfunction in both groups was higher than that in controls (21.6%). Patients with LAD showed impairment of all parasympathetic tests (all p<0.05) and one of the sympathetic tests (Mean fall in systolic blood pressure on standing: p=0.058) and those with SVD only showed impairment in two parasympathetic tests (heart rate response to deep breathing: p=0.010; heart rate response to standing: p=0.019) in comparison with controls. Patients with LAD had significantly more impairment than those with SVD in some autonomic parameters (Valsalva ratio: p=0.004; heart rate response to deep breathing: p=0.034; mean fall in systolic blood pressure on standing: p=0.004).

Conclusions: Cardiovascular autonomic function is impaired in ischemic stroke patients both with LAD and SVD, but patients with LAD show more severely impaired parasympathetic and sympathetic functions.

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**Thrombolysis in diabetic stroke patients: Results from the Austrian Stroke Unit Registry**

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Background: Diabetes has been known to be a predictor for poor outcome after thrombolysis in stroke patients, and early poststroke glycaemia is associated with higher rates of postthrombolytic symptomatic intracerebral haemorrhages. Therefore, diabetic stroke patients are often excluded from thrombolytic treatment. Up to now comparisons exist only from clinical trials and registry data of thrombolysed patients.

Methods: National database of the Austrian Stroke Unit Registry, 2004-2011, comprising 34 acute stroke units, comparison of outcome data of thrombolysed and non-thrombolysed diabetic and non-diabetic stroke. Stratification according to sex, age, stroke severity, functional impairment before stroke and recurrent stroke to non-thrombolysed diabetic strokes and to non-diabetic thrombolysed and non-thrombolysed controls. Improvement was defined as the difference between stroke severity at admission and at discharge.

Results: A modelled cohort of 792 r-tPA thrombolysed diabetic stroke patients from 14,209 ischaemic stroke patients were matched according to sex, age, stroke severity, and prestroke disability. A regression model with improvement as depending variable and age, sex, stroke severity, aetiology of stroke, risk factors (including diabetes) and treatment (including thrombolysis) found no effect of diabetes (p=0.470) or the interaction diabetes x thrombolysis (p=0.990), whereas the effect of thrombolysis itself was highly significant (p=0.0005). No differences were found in the number of symptomatic intracerebral haemorrhages after thrombolytic treatment between diabetic strokes (5.3%; CI: 3.9-7.0) and non-diabetic strokes (3.8%; CI: 2.6-5.3). Both groups had a higher risk of intracerebral haemorrhages compared to the non-thrombolysed groups (diabetic 2.7%; CI: 1.7-4.0, non-diabetic 2.5%; CI: 1.6-3.8).

Conclusion: Data from this first nationwide survey of diabetic stroke patients show a substantial benefit from thrombolysis and therefore diabetic strokes should not be excluded from thrombolysis treatment.
Background and Aims: Orolingual angioedema has been recognised as an infrequent complication of treatment with tPA (tissue plasminogen activator) for ischemic stroke. Preceding treatment with angiotensin converting enzyme inhibitors (ACE-I) have been implicated in the pathophysiology. The present study investigated the incidence of angioedema, its clinical characteristics and relationship with baseline clinical factors in patients receiving tPA at a single UK centre.

Methods: 348 consecutive patients over the age of 16y receiving tPA treatment for ischaemic stroke between 2004 and 2011 were included (median age 70y; median NIHSS 13; 60% male). Angioedema was classified as mild, moderate or severe using pre-defined criteria. The primary analysis was the association between prior ACE-I treatment and incident angioedema.

Results: At baseline, 32% were receiving treatment with ACE-I, 44% with statins and 49% with antiplatelet agents. Overall, orolingual angioedema was observed in 27 patients (7.8%, 95% Confidence Interval (CI) 5.2-11.1%), ranging from 5-189 minutes after initiation of tPA (median 65 minutes). In those developing angioedema, 59% were taking an ACE-I (p=0.003; odds ratio (OR) 3.45, 95% CI 1.55-7.73). 11% of the angioedema cases were severe (0.9% of all patients treated with tPA), requiring urgent advanced airway management.

Conclusion: In our experience, angioedema occurs more frequently than previously reported and is associated with preceding ACE-I treatment. Although angioedema was predominantly mild in severity, its development may be delayed and progress to life-threatening airway compromise. This has implications for the assessment and delivery of thrombolysis. Further studies are required to enhance identification of patients at risk of angioedema, and optimise management.
ers (EMDs) have an important role to play in recognising that callers are describing stroke, so they can facilitate a rapid response. However, EMDs receive limited training in relation to stroke. In order to inform any training it would be useful to understand the interaction between callers and EMDs. As part of a programme of research, we explored the interactions between callers and EMDs to develop a stroke-specific training package. The aim of this study was to evaluate the implementation of the training package.

Methods

We synthesised data from callers’ experiences of contacting EMS and the words used by callers when describing suspected stroke, to inform an on-line training package for EMDs. The training package content included information on: what a stroke is; different types of stroke; stroke as an emergency; who is most likely to contact the EMS for suspected stroke; how symptoms may be described by callers; transient ischaemic attack and stroke mimics. The training was introduced at an ambulance service over a four month period. Following completion of the training EMDs completed a multiple-choice test and an evaluation.

Results

Between October 2009 and January 2010, 67 EMDs completed the training package. The post-training test showed a median score of 88%, with no one scoring less than 76%. In a subjective rating, 95% reported an increased knowledge of the symptoms of acute stroke and stroke as a medical emergency. A majority of participants (97%) reported that they were either satisfied or very satisfied overall with the training.

Conclusion

This on-line stroke-specific training package provides a flexible approach to learning and increased stroke knowledge among EMDs. The course is accessible, fits in around working patterns and was successfully undertaken and completed by EMDs, who reported high levels of satisfaction with the content.

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STROKE OUTCOME AFTER INTRAVENOUS THROMBOLYSIS ACCORDING TO STROKE ETIOLOGY. DATA FROM A MULTICENTER REGISTER.


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Objectives: To identify possible differences in early response to intravenous Thrombolysis (IVT) or on stroke outcome at 3 months related to stroke etiology in acute ischemic stroke (IS) patients.

Methods: Multicenter Stroke Register with prospective inclusion of consecutive acute IS patients IVT-treated (SITS-MOST) criteria in five acute stroke units. We compared neurological improvement at 24 hours and at day 7 (NIHSS) as well as functional outcome at 3 months (modified Rankin Scale, mRS) among the different etiological stroke subtypes.

Results: 1479 patients included, 178 (12%) patients had large vessel disease (LVD) with substantial carotid stenosis, 175 (11.8%) LVD other than substantial carotid stenosis, 638 (43%) a cardiac origin, 60 (4.1%) lacunar infarction, 72 (4.9%) were CI of uncommon cause and 356 (24.1%) of none/multiple etiology. Patients with lacunar infarction had the lower stroke severity (median NIHSS 6) whilst cardioembolic IS were the most severe (median NIHSS 14) (p<.001). No differences in NIHSS improvement at 24 hours were found. Patients with LVD with substantial carotid stenosis (OR 0.544; 95%IC 0.383-0.772;p=0.001) were the less prone to improve significantly at day 7 after adjustment for age, gender, vascular risk factors and stroke severity on admission. However, adjusted multivariate analysis showed no influence of stroke etiological subtype on stroke outcome (mRS) at 3 months,
Objective of this study was to examine the performance measures and quality of a referral unit, especially designed to deliver thrombolytic therapy.

METHODS: Istanbul Bilim University Acute Stroke Thrombolysis Unit is a specialized referral center integrated with emergency medical system (EMS) where only thrombolytic therapy candidates are admitted. Hospitals and EMS can have direct access to the treating neurologist in-duty by a single telephone number. The referred patients are received by thrombolysis team at the emergency room (ER) and brought to the CT which is located together with the ER, at the ground floor near the entrance of ambulances. Thrombolytic therapy is started in the CT room. In this study data of patients, who underwent CT-based intravenous (IV) thrombolytic therapy at the first 4.5 hours were analyzed and compared with results of the SITS Stroke Database.

RESULTS: Between January and December 2011, 125 patients were admitted, 87% was referred from other hospitals. Thirty one patients (24.8%), 19 males, with a mean age of 61 (min: 37, Max: 89) had IV thrombolytic therapy. Median of door to imaging time (DIT), door to needle time (DNT) and onset to needle time (ONT) were 18 (SITS: 25), 40 (SITS:67) and 220 (SITS: 149) minutes, respectively. Three month mortality and functional independence (mRS 0-2) were comparable to SITS data. Symptomatic intracranial hemorrhage (sICH) according to SITS - MOST criteria rates was 3.6% (95% CI: 06-17,7) (SITS:1,7%(95% CI: 1,4- 2)).

CONCLUSION: Our data indicate that a

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Acute Stroke Thrombolysis Unit May Be Associated With More Favourable Performance Measures

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BACKGROUND: Stroke units facilitate implementation of thrombolytic therapy. In Istanbul, stroke units and thrombolytic therapy are not well organized. The objective of this study was to examine the performance measures and quality of a referral unit, especially designed to deliver thrombolytic therapy.

METHODS: Istanbul Bilim University Acute Stroke Thrombolysis Unit is a specialized referral center integrated with emergency medical system (EMS) where only thrombolytic therapy candidates are admitted. Hospitals and EMS can have direct access to the treating neurologist in-duty by a single telephone number. The referred patients are received by thrombolysis team at the emergency room (ER) and brought to the CT which is located together with the ER, at the ground floor near the entrance of ambulances. Thrombolytic therapy is started in the CT room. In this study data of patients, who underwent CT-based intravenous (IV) thrombolytic therapy at the first 4.5 hours were analyzed and compared with results of the SITS Stroke Database.

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CONCLUSION: Our data indicate that a
“thrombolysis unit” paradigm can significantly lower DIT and DNT and increase the probability of thrombolysis per admission. Because of high proportion of referrals, ONT can be long and may lead to higher rates of sICH. More data is needed to confirm the safety of thrombolytic therapy in such units.

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Implications of reorganization of the ambulance service for stroke patients admitted for thrombolysis

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Background
Fast pre-hospital management of patients with stroke is essential if they are to reach the hospital in time for i.v. thrombolysis or endovascular therapy. The ambulance service in the Danish Capital Region area was re-organized in September 2009, and the number of ambulances was decreased, leading to generally longer response times. The aim of the present study was to evaluate if the re-organization influenced the response and transfer time of stroke patients to the thrombolysis center.

Methods
The study is a retrospective analysis of ambulance charts from stroke patients suitable for thrombolysis from January 1st 2006 to July 7th 2011. The decision to refer the patient was taken after telephone contact between the paramedic and the neurologist. We noted response time from the initial emergency call, time used in the patient’s home, and transfer time to the hospital. In addition we noted sex, age, date, time of day and geographic area.

Results
We reviewed 481 charts (58% male), of which 58 were excluded because of incomplete data. Patients had a mean age of 64.5 years. The mean (SD) time interval from emergency call to the patient enters the hospital was 43 (16) minutes, with 18 (9) minutes spent in the patient’s home. There was no change in response time from emergency call to the patients home during the study period and between before (7 (4.7) minutes, N=186) and after (6 (4.3) minutes, N= 237) the organizational changes.

Older patients and longer distance to the hospital correlated with significantly longer transportation time (p<0.001). The transportation time was independent of season, time of day and patient sex.

Conclusion
The response time for patients admitted for thrombolysis was not affected of the changes in the ambulance service, suggesting a high priority for these patients. Time spent in the patient’s home was nearly half of the time used from call to ‘hospital door’ and future focus should
be to optimize workflow in this phase.

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Association of protein S100ß and NSE with Efficient Trombolytic therapy and Higher Risk of Hemorrhagic Transformation After Trombolytic Therapy in Acute Stroke
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Introduction: Cerebral haemorrhage is the most feared complication of thrombolytic therapy for acute ischemic stroke. Clinically relevant haemorrhagic transformation (HT) is more common with the thrombolysis. Serum samples were analyzed for the presence of 2 biochemical markers of neuronal and glial cell injury - NSE and protein S100ß were studied for association efficiency of trombolytic therapy (TT) and evaluation of higher risk of HT after thrombolytic therapy in acute stroke.

Methods: In our retrospective clinical trial were included 49 patients with ischemic stroke (mean age of 65.5 ±9.3 years; ) who had received TT within 4.5 hours of symptom onset. S100B and NSE levels were determined from pretreatment blood samples. Serum marker concentrations were measured by electrochemiluminescence immunoassay „ECLIA” techniques. Reference ranges in serum: NSE <16.3ng/mL, S-100<0.105 µg/L. Follow up brain (CT or MRIs) scans were obtained on presentation to the Emergency Department and 24 h after thrombolytic therapy. Efficient TT means improvement in NIHSS more than 2 points. HT was classified as either symptomatic or asymptomatic hemorrhage.

Results: 27 patients (55.1 %) of thrombolytic therapy were effective, 22 not effective. HT occurred in 9 patients (18.4 %; 3 symptomatic, 6 asymptomatic). 37 patients weren’t complications after TT. 3 patients had hemorrhagic complications from other organs. Median S100B values were significantly higher for patients with HT, symptomatic HT 0.427 versus 0.80 µg/L in asymptomatic HT group; p<0.05. Median NSE values were significantly higher with symptomatic HT, 14 versus 10 ng/mL; p<0.05. Median S100B values were significantly lower in patients with effective TT (0.085 versus 0.142 µg/L; p<0.05). Median NSE values were not significantly lower in patients with effective TT (12 versus 13 ng/mL; p>0.05 Mann-Whitney U test).

Conclusions: Elevated S100B and NSE serum levels before thrombolytic therapy constitute independent risk factors for HT in patients with acute stroke. Elevated S100B serum level before thrombolytic therapy constitutes a potential independent risk factor for efficient thrombolytic therapy.

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Creation and Reorganization of Stroke Units Significantly Reduce Delays in
Background. Any delays during hospitalization should be avoided for decreasing of the time from symptoms onset to treatment. Federal Anti-stroke program (ASP) has been started in 55 regions of the Russian Federation since 2008 and by now 205 primary and 55 comprehensive stroke units (SU) were created or entirely reorganized and united in the common telemedicine network. The aim of our study was to assess the influence of the novel SU network on door-to-onset time (DOT), door-to-CT time (DCTT), door-to-needle time (DNT), safety and efficacy of IV rt-PA in SUs in comparison with these parameters in several SUs before ASP has been started.

Methods. We enrolled all patients treated with IV rt-PA in SUs in routing clinical practice according NINDS protocol that were registered in internet-based hospital registry (01Jan 2009-31Dec 2011). All SUs have unified structure with all possibilities for acute stroke care, neurorehabilitation and CT for 24 hs. CT scanners locate close by to SUs; patients admit omitting emergency department directly to SU. Median DOT, DCTT, DNT, mortality rate as well as number of patients with good outcome (mRs score 0-1) were calculated. These data we compared with results of survey obtained at 48 SUs before ASP was started (01Jan 2006-31Dec 2007).

Results. By IV rt-PA were treated 691 patients before ASP and 2415 patients after (patients were comparable for age, gender and stroke severity at admission). Significantly reduced DCTT (13 min vs 35 min, p<0.01) and DNT (50 min vs 74 min, p=0.005) were observed after ASP. There were no changes in DOT. The 30-day mortality rates were similar (12.8% vs 13.9%; p=0.8) and the good outcome rate was higher after ASP onset (38.5% vs 30.7%; p=0.035).

Conclusion. These data suggest that the network of unified SUs created due to ASP can significantly reduce delays in hospitals for IV thrombolysis and provide additional possibilities for good functional outcome in rt-PA treated patients.
Study of inflammatory factors in cerebral ischemia can be used as additional markers of risk assessment as stroke and effectiveness of treatment strategies. The task was to study the level of leukocyte activity and the contribution of myeloperoxidase (MPO) in the acute stage of ischemic stroke (IS). The study included 55 participants: 45 patients with IS (not exceed 48 hours) and 10 of healthy individuals. Quantification of MPO ELISA was carried out - the method in accordance with the protocol, using a set BenderMedSystems (Austria). Phagocytic activity of neutrophils using the original method of chemiluminescence in the presence or absence of an activator of neutrophils 5 µg / ml forbolmiristatsetat (FMA) for chemiluminometer SMARTLUM 5773 (Russia). Statistical processing - StatSoft, USA. Patients with IS were divided into 2 groups. The first received basic therapy antihypertensive, antiplatelet and antidiabetic agents. Patients of the second group in addition to basic therapy received 300 units of alpha-lipoic acid (ALA) per day, intravenous, 10 days.

A comparison of the phagocytic activity of neutrophils activated by FMA in patients with IS and a group of healthy individuals significant differences were observed. It was found that in patients with IS of MPO was significantly higher (p <0.05) of the control group (Me = 111.5 and 33.8, the values of the upper quartile and UQ = 207.9 UQ = 69.5). The treatment results showed a significant decrease (p <0.05) level of MPO in patients treated with ALA, compared with patients who received basic treatment (significant change in the median (Me (group 2) = 73, Me (group 1) = 106 and the upper quartile (UQ = UQ = 100 and 135), indicating a decrease in the activity of systemic inflammation, which is implemented through the direction of the antioxidant ALA.

Conclusion. Analysis of the data led to the conclusion that patients in the acute phase of ischemic stroke recorded activation of systemic inflammation and associated oxidative stress, which requires medical correction. The criterion of effectiveness of treatment may be changing the number of MPO in plasma of patients with IS.

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Mobilisation within 24 hours of acute stroke. A randomised controlled trial. Akershus Mobilisation in Stroke Study (AKEMIS)
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Background
Treatment in stroke units reduces mortality and disability compared to treatment in general medical wards. Very early mobilisation (VEM) is regarded to be
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Symptomatic intracerebral hemorrhage (SICH) after intravenous thrombolysis – new clinical predictors, and applicability of the HAT score

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Background: The Hemorrhage After Thrombolysis (HAT) score was published in 2008, establishing risk predictors of post-thrombolysis SICH based on NIHSS score, ischemic changes on CT, and diabetes. We aim to identify SICH risk predictors in our local population. Our secondary aim is to assess the clinical applicability of the HAT score.

Methods:
We conducted a retrospective review of our thrombolysis data from January 2009 – November 2011 in the National Neuroscience Institute, a tertiary stroke unit in Singapore. Clinical variables analyzed included: age, body weight, diabetes, hypertension, prior stroke, antithrombotic therapy, atrial fibrillation (AF), ejection fraction (EF) ≤ 35%, time to treatment, baseline NIHSS score, blood pressure, stroke syndrome, platelet count, hyperdense artery sign on CT, ischemic changes on CT, presence of microbleeds on MRI, and use of mechanical thrombectomy.
Results:
122 patients were thrombolyzed. 102 (83.6%) were treated within 3 h of stroke onset, the remaining 20 (16.4%) within the 3 - 4.5 h window. 46 (37.7%) developed ICH on routine 24-hour CT/MRI scans. 13 (10.7%) were symptomatic ICH (SICH), defined by NINDS criteria as any ICH temporally related to clinical deterioration. The same patients also fulfilled the SITS-MOST definition of SICH, having PH2 or PHr2 parenchymal hematomas. 4 (3.3%) deaths were attributed to ICH. Amongst the variables studied: diabetes, AF, EF ≤ 35%, NIHSS ≥ 20, left hemispheric strokes, and ischemic changes on CT were associated with a higher risk of SICH. Higher HAT scores also correlated well with SICH risk.

Conclusion:
Our study supports the use of the HAT score in predicting SICH. Hemorrhagic transformation occurs more frequently following cardioembolic strokes. This may explain why AF and EF ≤ 35% have shown up as risk predictors for post-thrombolysis SICH. Larger studies need to be done to assess the potential for incorporating these risk factors into scoring systems for SICH.

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What Are the Most Common Contraindications other than Time for IV-tPA Thrombolysis When t-PA Code Has Been Activated for Acute Stroke Patients?
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Background: There are so many contraindications other than time for IV thrombolysis (IVT) in Acute Ischemic Stroke (AIS) Patients.

Aim: To evaluate rate other than time for IVT.

Methods: In a tertiary university hospital, t-PA code was activated for any patient with acute stroke symptoms according to Cincinnati stroke scale, if the symptoms onset were less than three hours. In a prospective study, during the six-month study period between June and December 2010, Code was activated For 86 patients but IVT was contraindicated in 52. The causes are reported.

Results: The contraindications were ICH in 18 patients (35%), minor stroke in 8 (15.3%), rapidly improving symptoms in 6 (11.5%), awakening stroke in 4 (7.7%), patients refuse, recent head trauma, conversion and seizure at symptoms onset, each in 3 (5.8%), refractory HTN and oral anticoagulation with INR>1.7 each in 2 (3.8%), large stroke and IV anticoagulation with PTT> 40 sec each in one (1.9%) patient. In 4 patients (7.7%) during in hospital investigations we lost three hour golden time for IVT. IVT were done for 34 patients (39.5%) of all t-PA code activations.

Conclusion: ICH was the most common contraindication of IVT for patients whom t-PA code was activated. Base on new guidelines, not considering minor stroke and rapidly improving symptoms as contraindications, IVT rate would rise up to 30%.

key words: Stroke, Thrombolytic Therapy, Eligibility Determination.
levels were observed between patients scoring 0-2 in mRS3m and patients with mRS3m 3-6.; alpha-1globulin levels were higher in patients with mRS3m 3-6 (4,34%vs5,33%, (p<0,001)); alpha-2globulin were also increased in patients with mRS3m 3-6 (10,9% vs 12,1% (p<0,05)). Albumin levels were significantly lower in patients with mRS3m 3-6 (57,2% vs 54,9% (p<0,05)); no differences for homocysteine, alpha-1, alpha-2 and albumin for total transformation haemorrhage were found. Multivariate analysis adjusted for age and total time to treatment confirmed the effect of albumin as a factor of bad prognosis (OR 1,14, IC 1,00-1,30, p=0,04).

CONCLUSIONS
Low level of albumin may be a marker for bad prognosis in patients treated with IVT. No differences in prognosis are observed in homocysteine and alpha-1 globulin levels. Further studies are needed to confirm those findings.

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Warfarin-induced intracranial bleeds: Suboptimal management and need for a national clinical quality standard.

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Background: Current UK guidelines for management of acute stroke recommend brain imaging is performed within one hour for patients on anticoagulant treat-

ment. For haemorrhagic strokes, clotting levels should be returned to normal as soon as possible using vitamin K and prothrombin complex concentrate (PCC). This study aimed to assess compliance of a district general hospital with these guidelines and to determine the cause of treatment delays.

Method: This was a retrospective study at a district general hospital. Cases were identified by analysing clinical coding data for all inpatients over a 2 year period until December 2010. Cases were identified as those with a diagnosis of intracerebral haemorrhage and a second diagnosis of being on warfarin. Case notes, prescription charts and computer-based requesting systems were then examined to investigate initial management.

Results: 23 cases were identified. Of these, only 6 (26%) presented within 2 hours of symptom onset, with 7 (30%) presenting more than 24hrs after symptoms began. Only 2 (9%) had a CT report available, and 3 (13%) an INR result, within one hour of triage. Delays occurred at every stage: requesting, obtaining, and reporting these tests. Only 8 (35%) received the recommended vitamin K and PCC, and administration was often delayed, with 45% of warfarin-reversal agents given more than three hours after the CT report was available. Outcomes were poor, with 50% mortality.

Conclusion: Management of warfarin-induced intracranial bleeds could be improved. Delays in initial presentation, diagnostic imaging and in reversal of warfarin continue to occur despite guidelines. An ongoing effort to increase pub-
lic awareness and training of non-stroke professionals is required. Setting up a national clinical quality standard would bring a real difference in the management of these patients.

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MORTALITY REVIEW OF STROKE UNIT IN A DISTRICT GENERAL HOSPITAL
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BACKGROUND AND OBJECTIVES: According to Dr Fosters Hospital Standardised Mortality Rate (HSMR), Northern Lincolnshire and Goole hospitals trust had a Relative Risk score of 124.9 for stroke between 1st February 2010 to 31st January 2011. A local review was planned at Diana Princess of Wales hospital, Grimsby, UK to determine the possible causes for high mortality and whether these deaths were avoidable.

METHODS:
During the study period from 1st January to 31st December 2010, 340 patients were admitted with stroke, out of which 83 died. Of these, 64 case notes were available for review and were included in the study. Data was entered onto a standardized data collection form and 2 Matrix and Global Trigger Tool was used to answer the study objectives.

RESULTS:
The in-hospital mortality rate during the study period was 24.4%. Mean age was 80 and 51% were females. Although cases of cerebral infarction formed majority (46) of deceased patients, patients with intracerebral haemorrhage had the highest mortality rate (45.8%). 14.06% were initially diagnosed with something other than stroke, 7.04% had evidence of planning failures in the first 48 hours, however, 98.4% deaths were considered unavoidable by the auditors. 34 (53.2%) were considered to have stroke as the only cause of death while 46.8% experienced 1 or more medical complications during hospitalization. The most common complications were pneumonia (76.6%), seizures (13.3%) and upper GI bleed (3.66%). 57% patients died within 7 days of admission. 60% and 96% patients were placed on Liverpool Care Pathway (LCP) and Do Not Resuscitate (DNR) order respectively, at some point during their admission. 107 ‘bed-days’ were spent in hospital for terminal care.

CONCLUSIONS:
The in-hospital mortality rate of our stroke unit was 24.4%. 53.2% died of severe strokes and 46.8% experienced complications, most commonly pneumonia. Only one of these deaths was considered avoidable while about two third patients had appropriate end of life care in place. 107 ‘bed-days’ could have been saved if palliative care was improved in community.
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Stroke Diagnosis and Treatment: Optimization of Clinical Processes and Workflow
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Background
Due to high incidence and morbidity of stroke, the Helsingborg Declaration postulated an European standard for successful stroke care but striking disparities in stroke services still exist. Scanning of other areas of science was requested in order to encounter solutions for improvement. Hospitals should compete to find the best ones which then should serve as guides for further development. Optimization of industrial processes and determination of key performance indicators in order to proof their efficacy is standard since many years. The aim of our study is to evaluate whether industrial concepts can be transferred to stroke care in order to support the above mentioned targets.

Method
We transferred the Capability Maturity Model framework, a well-known principle in software industry, into a maturity model for evaluation of clinical processes in stroke care. Key elements of this model are clinical guidelines, best practice processes and results of relevant scientific studies. The presented maturity model consists of a questionnaire with 450 criteria related to defined key process areas in stroke care.

Results
18 hospitals were evaluated and compared on basis of this model in all areas relevant to diagnostics, treatment and follow-up. Comparison with best practice processes identified potentials for improvement and simulating the impact of specific interventions was helpful to prioritize revision measures in order to achieve a higher maturity level. Results from selected hospitals showed the feasibility of this approach. Improvements in quality parameters were achieved after implementation of selected improvement measures.

Conclusion
The method is a standardized and unbiased approach to benchmark stroke care against best practice-standards. Its result is a defined process-maturity-score used to identify potentials for optimizing processes and efficiency in stroke care. Association of process maturity to clinical outcome and financial impact has to be proven yet.

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Admission Systolic Blood pressure predicts Clinical Outcome in Large Artery Atherosclerosis
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Background and purpose: Multiple studies have shown that high BP is associated independently with poor outcome, including both early death, and late death/dependency. But few studies reported the effect of admission BP on different stroke subtypes. We performed a cohort study to investigate the predictive value of admission SBP on clinical outcome in patients with different stroke subtypes. Methods: Patients with acute ischemic stroke were recruited from our stroke cohort from Jan to December 2009 and classified into subtypes according to TOAST criteria. Patients were followed up for three months to assess modified Rankin Scales (poor clinical outcome was defined as mRS≥3). Results: Totally 796 patients were recruited, with mean age of 71.2±12.3 yr and 52.6% male. According to TOAST classification criteria, 230 (28.9%) patients were defined as large artery atherosclerosis, 260 patients as small-vessel occlusion, 215 ones as cardioembolism and 121 ones as stroke of other determined and undetermined etiology. Among the whole group of patients, multiple regression found that age (p<0.001, 95% CI 1.037-1.076), admission NIHSS (P=0.001, 95% CI 1.202-1.311), and chronic heart failure (P=0.032, 95% CI 1.078-5.568) were independent risk factors of poor clinical outcome in three months after stroke onset. In subgroup analysis, age(p<0.001, 95% CI 1.027-1.099), admission NIHSS (p<0.001, 95% CI 1.193-1.424), admission SBP (p=0.003, 95% CI 1.007-1.034) and chronic heart failure(p=0.028, 95% CI 1.216-29.895) were found to be independent risk factors of poor clinical outcome in patients with large artery atherosclerosis. Admission SBP failed to be verified to predict poor clinical outcome in patients with small-vessel occlusion, cardioembolism or those with stroke of other determined and undetermined etiology. Conclusions: Our study shows that admission SBP can predict clinical outcome in patients large artery atherosclerosis rather than in those with other stroke subtypes. Considering the different effects of blood pressure on outcome, clinical strategies of blood pressure treatment should be designed in patients with different stroke mechanisms.

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Has the FAST stroke campaign improved access to specialist services for suspected transient ischaemic attack?

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Background
The FAST (Face, Arm and Speech) poster and television campaign, launched in 2009 in England and Wales, aims to reduce disability from stroke by promoting public recognition of stroke signs and urgent healthcare seeking behaviour. 2 phases have been launched to date; February 2009 and March 2011. We aimed
to identify the campaign’s effectiveness on healthcare-seeking behaviour for transient ischaemic attack.

Methods
Time intervals between symptom-onset, first healthcare contact, clinic referral and specialist review were collected for a total of 1512 attendees to a daily rapid-access one-stop TIA clinic across four time periods: October 2008 - January 2009 (prior to the first FAST campaign), August 2009 - November 2009 (after the first launch), June 2010 - September 2010 (prior to the second FAST campaign) and April 2011 - July 2011 (after the second launch). Intergroup differences were analysed using the Mann-Whitney U test.

Results
Date interval | Symptom onset to first healthcare contact (days, median [IQR]) | First healthcare contact to specialist review (days, median [IQR])
--- | --- | ---
FAST pre-launch phase (n=316) | | |
Oct 08 - Jan 09 | 3 [1, 11] | 2 [1, 3]
FAST first phase (n=342, 445) | | |
Aug 09 - Nov 09 | 1 [0, 5]* | 2 [1, 3]
Jun 10 - Sep 10 | 1 [0, 5]* | 2 [1, 5]
FAST second phase (n=409) | | |
Apr 11 - Jul 11 | 1 [0, 5]* | 1 [1, 3]

*p<0.001 compared to pre-launch phase.

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**Stroke mimics in a stroke unit - retrospective observational study**
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Background: Stroke is the leading cause of mortality and morbidity in Portugal. The diagnosis of stroke is clinical, complemented by imaging. Few studies analyzed the diagnostic accuracy after initial patient screening in the emergency department and treatment in a stroke unit. The aim was to study the diagnostic accuracy of stroke in all patients admitted to stroke unit and the initial presentations and pathologies that most frequently led to an erroneous diagnosis of stroke.

Methods: We conducted an observational retrospective study of admitted patients in a stroke unit between January 2007 and October 2011, with a diagnosis other
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**Oral anticoagulation is a frequent challenge for emergency management of acute ischemic stroke**

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**Background and purpose:** Oral anticoagulation (OAC) represents an effective strategy to prevent ischemic stroke (IS) and TIA. However, OAC can pose a challenge for the management of acute ischemic stroke patients. Because the quantitative relevance of this combination for emergency care of IS is unknown, we determined the proportion of patients using OAC admitted to our neurological ER and assessed management.

**Methods:** A prospective, consecutive, observational study enrolling all patients with IS or TIA admitted to our neurological ER was performed between 08/2009 and 02/2011. Using a standardized questionnaire, basic demographic variables, NIHSSS, CHADS2 risk factors, the present use of OAC, and modified Rankin scale score at 3 months were documented. In IS patients under OAC, INR values and the interval since symptom-onset than stroke. Present 46 cases, grouped by diagnosis according to ICD-10 classification, evaluated for admittance symptoms/signs, NIHSS scale and vascular risk factors.

**Results:** Of 1203 patients admitted in stroke unit, 46 did not have a diagnosis of stroke (3.8% false positives), 63% men and 37% women, aged between 16 and 88 years (average 53.15). 16 diagnoses were found, most frequent were: conversion disorder (11/46, 23.9%), epilepsy (10/46, 21.7%) and headache (8/46, 17.4%). Prevalent symptoms were upper limb paresis (27/46), changes in sensitivity (21/46) and headache (11/46). Initial NIHSS showed a median of 2. Vascular risk factors most observed were hypertension (41.3%) and smoking (23.9%). 4/46 patients were subjected to thrombolysis (1.8% of total thrombolysis), without complications, including bleeding.

**Conclusion:** The initial diagnosis of stroke relies on medical history and suggestive neurological examination, often without imaging confirmation, given the urgency of diagnosis for eventual thrombolysis. In this study, stroke mimics, including thrombolysis-treated patients, were reduced and similar to the literature, without significant complications. The need for early treatment in an appropriate clinical context outweighs the risk of potentially deleterious effects of thrombolysis in patients without cerebrovascular disease.
were recorded. In OAC patients presenting within 4.5h after symptom-onset, thrombolysis rates were documented. Results: In total, 1,914 patients were included into data analysis (median age: 72 y; IS: 69.7%, TIA: 30.3%). OAC were used by 8.7% of all patients. OAC patients were older than patients without OAC (78 vs. 72, p=<0.001). In the majority of IS patients taking OAC, INR values were <2 (60.5%). In IS patients, OAC were used in 7.8%; 54.8% of these (n=57) presented within the time window for thrombolysis. 15/57 patients with INR <1.6 received intravenous thrombolysis, another 6/57 underwent interventional recanalisation

Conclusions: Patients with current use of OAC represent a relevant proportion of acute IS. Optimizing the emergency management of these patients is important.

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Examining access to stroke thrombolysis in the state of Victoria, Australia. C. Bladin¹, K. Coughlan², I. Mosley³, B. Barger⁴, J.E. Bray⁵
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Introduction: Current Emergency Medical Service’s (EMS) protocols in the state of Victoria (Australia) instruct paramedics to transport acute strokes (<6 hours) to the nearest stroke thrombolysis centre (STC) if within a 60 minute transport time. This study aimed to determine: 1) if this practice is followed and 2) what proportion of the suspected stroke population fall within a 60 minute transport zone of a STC in Victoria. Methods: Electronic data collected by EMS in the field and stored in Ambulance Victoria databases were used. Objective 1 examined state-wide cases occurring over 6-month periods with an EMS assessment of acute stroke. Cases not transported to a STC were reviewed for thrombolysis eligibility and reason for destination. Objective 2 examined state-wide cases with an EMS assessment of stroke over a 12-month period. MapInfo software was used to explore the location of stroke cases in relation to STCs.

Results: Objective 1: Paramedics identified 1,451 and 471 cases as acute stroke in metropolitan and rural areas, respectively. The majority of metropolitan cases (89%) were transported to STCs, but only two-thirds (65%) of rural cases. Most of the acute strokes that were transported elsewhere were ineligible for thrombolysis; only 24 (of 164) metropolitan cases and 43 (of 166) rural cases were considered eligible from available documentation. Reasons for EMS choice in destination were closest ED, closest ED on bypass, clinical guideline, patient/guardian choice, and patient history at destination. Objective 2: All stroke cases occurring in metropolitan regions were within 60 minutes of a STC, but only 77% of rural cases –most occurring
within one region of the state. The addition of four rural STC in this area would increase state coverage to 94%.

Conclusion:
Access to a stroke thrombolysis centre in metropolitan Melbourne is excellent and the majority of suspected acute strokes are transported to these centres. Some rural regions currently have poorer access to STC, however with plans to commence part-time STCs, telemedicine and “ship & drip” protocols it is hoped that access to stroke thrombolysis in these areas will improve.

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Intra-hospital delays in stroke patients treated with rt-PA: impact of pre-admission notification to the emergency medical system and to the neurologists.

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Background: pre-hospital notification enhances thrombolysis rate and improves intra-hospital delays, but the impact of the notification to the neurologist by the emergency medical system (EMS) call centre remains unknown.

Objective: to compare pre- and in-hospital delays in stroke patients treated by intravenous (i.v.) rt-PA with and without pre-hospital notification.

Methods: we compared baseline characteristics and in-hospital delays in stroke patients treated by rt-PA with a high-level notification (call to EMS and discussion EMS-neurologist), a low-level (call to EMS without discussion EMS-neurologist) and no pre-hospital notification.

Results: of 302 consecutive patients (165 women, 54.6%; median age 74 years, interquartile range [IQR] 59-83), patients with high-level, low-level and no notification differed for the severity at admission (median national institutes of health stroke scale respectively of 12, IQR 7-17; 9, IQR 6-15, and 8, IQR 6-14, p=0.029). Patients with high-level notification had shorter (i) admission-to-completion of imaging times (27 min, IQR 14-35) than patients with low-level notification (35 min, IQR 17-54) or no notification (36 min, IQR 30-58) (p<0.01);
Background: Stroke is one of the leading causes of death and disability in western countries. In 1998 Baden-Wuerttemberg (BW), a federal state in south-west Germany with approx. 10.8 million inhabitants on an area of 35.741km2 (13.800 miles2) implemented a structured medical concept for stroke treatment with three competence levels (local and regional stroke-units and stroke centers). Since 2004 the concept is monitored with a quality register. Methods: All hospitals involved in acute stroke care have to participate in this registry by an agreement based on law (SGB V, §137). Hospitals that do not provide sufficient data quality nor fulfill the state-wide quality standards are requested for a structured interview that is provided by the monitoring center since 2004. A centralized consistency monitoring for the provided data has been installed in the year 2005.

Results: All stroke patients >/=18 years of age and admitted to inpatient care within 7 days after onset are registered. Exclusion criteria are subarachnoid hemorrhage, stroke because of traumatic events or intracranial malignancy. Approximately 200,000 cases have been included in the database up to 2010. The assessment includes parameters of clinical presentation, risk factors, use of Neurology, University Hospital of Heidelberg, University of Heidelberg, Heidelberg, GERMANY7, Department of Neurology, University Hospital of Heidelberg, University of Heidelberg, Heidelberg, GERMANY8, Department of Neurology, Universitätsmedizin Mannheim, University of Heidelberg, Mannheim, GERMANY9

Conclusion: pre-hospital notification by the EMS reduces intra-hospital delays in patients eligible for rt-PA, but the benefit is higher in case of discussion between the EMS and the neurologist before admission.

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A consecutive and prospective stroke-database in Southwest-Germany

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Three different classification of sICH are frequently used: SITS (Safe Implementation of Thrombolysis for Stroke) – parenchymal type 2 haemorrhage (PH2) within 24 hours of treatment and deterioration by ≥4 points NIHSS or leading to death, ECASS II (European Cooperative Acute Stroke Study) – any new haemorrhage and clinical deterioration or neurological decline by ≥4 points NIHSS and NINDS (National Institute of Neurological Disorders and Stroke) - any new haemorrhage and any neurological worsening. All of them are associated with poor clinical outcome. However, it is not established which one carries the highest predictive value for the long term outcome. Our aim is to compare those classifications in terms of 3-month outcome. We analyzed 4199 acute stroke patients and timing of diagnostics and thrombolytic therapy. Conclusion: We present a prospective stroke quality monitoring register with the largest consecutive annual number of included stroke patients in Europe. The annual number has risen to approx. 35,000 cases, resulting in an incidence of stroke and TIA of >300/100,000/year. The database provides excellent opportunities to perform cross sectional and longitudinal comparisons of stroke epidemiology and quality of stroke care in standard clinical practice. Due to the extensive documentation of procedural quality parameters, an evaluation of overall thrombolytic therapy is possible and will be presented during the ESC including data from 2011.
treated with intravenous thrombolysis that were contributed to the SITS registry by 9 Central and Eastern European countries between February 2003 and February 2010. All included patients had a complete 3-month follow-up. The frequency of sICH was 2.1% for SITS definition, 7.0% for ECASS and 9.9% for NINDS. The positive predictive value (PPV) for 3-month mortality was 0.81, 0.78 and 0.65, respectively. The PPV for death or disability was 1.00, 0.97, and 0.94. The OR for death at 3 month follow-up comparing the SITS and ECASS definition was 1.20 (95%CI:0.66-2.17), p=0.554, SITS and NINDS 2.26 (95%CI:1.28-3.98), p=0.004 and ECASS and NINDS 1.89(1.34-2.66), p<0.001. The differences in 3-month death or disability rate were significantly worse for the SITS defined sICH comparing with NINDS, (p=0.005). Our findings show, that SITS defined sICH has the highest PPV for poor outcome after 3 months in ischaemic stroke patients treated with intravenous thrombolysis. Considering the time point for the occurrence of sICH, it also seems to have the strongest relation to the treatment itself. Therefore, it would be rational to prefer this classification for stroke research and everyday clinical practice.

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Effect of infection (preceding or following stroke) on outcome after thrombolysis: data from the MAGIC STUDY
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Background: Infections are known to affect stroke severity and outcome. Whether infections influence response to thrombolysis is still unknown. rtPA interaction with inflammatory and proteolytic cascade theoretically concur with thrombolysis failure and hemorrhagic transformation (HT). Methods: We examined patients with acute ischemic stroke treated with rtPA prospectively enrolled in the MAGIC study, a multicentre study exploring the potential prediction of a number of biomarkers related to stroke outcome after thrombolysis. History of infection before onset was systematically collected as potential confounder of biomarkers effect. We considered as outcomes the achievement of mRS≤2 or 3 or more at 3 months, and the presence or not of relevant HT, including parenchymal hematoma 1 or 2. Outcome co-factors were baseline NIHSS, hyperglycemia (>150 mg/dl), age, response to rtPA (decrease of ≥4 points or NIHSS 0 at 24 hours), relevant HT and pre- or post-stroke infection. Results: Out of 238 patients included (mean age 69.1 ± 11.8, males 56.3%), 23 (9.6%) had pre-stroke infection. Patients with pre-stroke infection had a stroke significantly more severe than those without (mean NIHSS 11.8±5.8 vs 15.3 ±7.0; p 0.008). The rate of relevant HT did not differ (17.4% vs 11.5%, p 0.399). Post stroke infec-
tion occurred in 78 patients (35.9%). In the whole series 148 patients (62.4%) achieved a good outcome (mRs≤2). After adjustment for confounders, there was no effect of pre-stroke infection on 3-month mRs (OR 0.9, 95%CI 0.2-3.6). In contrast, post stroke infection was associated independently with bad outcome (OR 3.6, 95%CI 1.5-8.1), together with age, stroke severity and non response to thrombolysis. Conclusions: Despite its association with baseline stroke severity, pre-stroke infection does not influence outcome after thrombolysis, while post stroke infection maintains a negative effect despite thrombolysis.

METHODS
The Helsinki BAO Registry includes 164 consecutive patients with angiographically verified BAO, treated with iv thrombolysis. Protocol violations (PVs) occurred in 61 patients (11 time PV, 39 extensive baseline infarct, and 19 both PVs). Outcome was evaluated with modified Rankin Scale (mRS) at 3 months; 1 patient was lost to follow-up. Final cohort consists of 102 patients without PVs, of which 86 had post-treatment angiography. The major reason for missing post-treatment angiography was death. Recanalization (R+) refers to Thrombolysis in Myocardial Infarction (TIMI) recanalization score of 2-3, and no recanalization (R-) to TIMI 0-1. We had 4 OTT categories: ≤6 h, 6-12 h, 12-24 h, and 24-48 h.

RESULTS
Figure 1 shows 3-month mRS per OTT categories. Figure 2 shows 3-month outcome per time category and recanalization status (R+ / R-). Non-dependent status at 3 months (mRS 0-3) was achieved in 46% (63% when recanalized) of BAO patients treated up to 24 h of symptom onset, with a shift towards mRS 3 with prolonging OTT up to 24 h. Of the small number of patients treated beyond 24 h (n=6, all with phenotype 2), 4 ended up with mRS 2. Of 11 patients with time PV, 8 had phenotype 1 and were treated between 12-24 h (75% had mRS 0-3, 100% when recanalized), whereas 3 had phenotype 2 and were treated beyond 48 h (66% had mRS 0-3, 0% when recanalized).

CONCLUSIONS
In BAO patients, non-dependent out-

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Time window for basilar artery occlusion thrombolysis up to 48 hours from symptom onset
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BACKGROUND
While the time window for iv thrombolysis of hemispheric stroke is 4.5 h, variable time windows are applied for basilar artery occlusion (BAO). In line with our institutional protocol, we administer iv thrombolysis to patients with acute massive symptoms (phenotype 1) up to 12 h, and with gradually progressing symptoms (phenotype 2) up to 48 h from symptom onset. We present the outcome of BAO per onset-to-treatment time (OTT).
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Loss of penumbra by impaired oxygen supply? Decreasing Hemoglobin and Hematocrit levels predict infarct growth after acute ischemic stroke. STroke: RelevAnt Impact of hemoglobin, Hematocrit and Transfusion (STRAIGHT) – an observational study

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Background and purpose: Anemia is common in elderly patients with ischemic stroke. Recently, the association of mortality and poor outcome with reduced levels of hemoglobin (Hb) and hematocrit (Hct) in patients admitted for acute ischemic stroke was demonstrated. To penumbra salvage an optimal level of hemoglobin would appear to be decisive. Thus, we aimed to investigate in this study a putative association between low Hb and Hct levels and infarct growth.

Methods: All consecutive patients, who received intravenous thrombolysis based on multimodal magnet resonance imaging (MRI) during the years 1998-2009 were screened (n=258). Mismatch was defined as visually detected perfusion MRI lesion that was 20% greater than diffusion weighted imaging (DWI) lesion. The dynamics of Hb, Hct as well as admission MRIs and follow-up computer tomography (CT) scans were assessed. Overall, 100 patients with sufficient data quality were dichotomized according to the median infarct growth.

Results: The DWI volume was similar between the two groups (13 vs. 17ml, p=0.47), while the perfusion weighted imaging (PWI) volume (173 vs. 118ml, p<0.001) and mismatch volume (145 vs. 82ml, p=0.004) was higher in patients with infarct growth above the median of 2.9ml. Hb decrease (0.4 vs. 0.9g/dl, p=0.04) and Hct decrease (1 vs. 3%, p=0.002) from admission to follow-up CT was significantly greater in patients with enhanced infarct growth than in
patients with less infarct growth. Step-wise logistic regression model to predict infarct growth found Hb decrease (OR 1.67, p=0.03) and Hct decrease (OR 1.27, p=0.006) to be independent predictors adjusted to mismatch volume (OR 1.01, p=0.002), age (p=0.39), NIHSS on admission (p=0.39) and white blood cell count until follow-up CT (p=0.25).

Conclusion: Decreasing Hb and Hct levels predict infarct growth in MRI-based thrombolysed stroke patients independently of mismatch volume. The clinical implications of this relationship remain to be investigated.

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Impact of a clinical pathway for stroke care in a Stroke Unit

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Objectives: To assess the impact of implementing a clinical pathway (CP) for stroke care in a Stroke Unit (SU).

Methods: Observational study of patients with acute stroke admitted to our SU for four years before the CP (2003-2006) (Pre-CP) and four years after CP implantation (2007-2010) (Post-CP). Variables analyzed: demographic data, vascular risk factors, stroke severity (Canadian Neurological Scale -CNS- severe stroke if CNS <=6), diagnostic tests, treatments on admission and during hospitalization, inhospltal complications, length of stay and outcome at discharge (modified Rankin Scale –mRS- favourable outcome if mRS <=2), comparing the Pre-CP and Post-CP groups.

Results: A total of 2208 patients were included, 1048 Pre-CP y 1160 Post-CP, with similar sex distribution and age (percentage of males 57.5% vs. 61% and mean age 68.69 vs. 68.78 years, respectively, P NS). Pre-CP patients had more frequently than Post-CP patients: severe strokes (32% vs. 26.7%, P=0.007), systemic complications (17% vs. 12.2%, P=0.001) and neurological complications (18.4% vs. 13.3%, P=0.001). Clinical outcome was similar in both groups. Post-CP patients were more frequently treated with intravenous (IV) thrombolysis (21.4% vs. 5.4%, P<0.0001), antihypertensives drugs (64.8% vs. 56.9%, P < 0.001) and statins (66.6% vs. 23.9%, P < 0.0001) than Pre-CP. Multivariate analysis showed that the Post-CP group had less inhospltal systemic complications (OR 0.643, 95% CI: 0.487-0.848) than the Pre-CP group, adjusted by baseline data, previous treatment, stroke severity, stroke subtype, IV thrombolysis and inhospltal length of stay.

Conclusion: the implementation of a CP for stroke care in a SU is associated with a reduction of systemic inhospltal complications.
Severely Elevated Diastolic Blood Pressure in the Field and on Arrival Is Associated with Delay in Initiation of Intravenous Thrombolysis in Acute Ischemic Stroke

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Background: Stroke patients with severely elevated blood pressure (>180/110) are eligible to receive antihypertensive therapy prior to intravenous thrombolysis. We sought to determine if severely elevated prehospital (pre) and emergency department (ed) blood pressure led to lower rates of TPA utilization and longer times to treatment.

Methods: Consecutive subjects with acute cerebral ischemic syndrome (ACIS, no hemorrhage on initial imaging, no stroke mimic) enrolled in Field Administration of Stroke Therapy Magnesium (FAST-MAG) had BP recording in the field and on ED arrival.

Results: Of 1107 consecutive subjects, 800 had ACIS, 269 intracranial hemorrhage, and 38 stroke-mimicking conditions. 710 with complete data set and were included. IV TPA was used in 232 (31%) who were aged 71 (SD 13) years, 46% women, 21% Hispanic ethnicity and 79% white race. Median (IQR) onset to paramedic evaluation was 24 (15, 44) minutes, onset to ED arrival 60 (48, 88) min, door to imaging 32 (22, 46) min and door to treatment of 112 (71, 118) min. Severely elevated values were recorded for preSBP in 50 patients (22%), preDBP in 40 (17%), edSBP in 20 (9%), and edDBP in 17 (7%). Rates of TPA utilization did not vary with severely elevated prehospital or arrival BP (preSBP 31% v 31%, preDBP 25% vs 32%, edSBP 29% vs 32%, edDBP 40% vs 31% all not significant). Time from door to needle were no different in those with severely elevated preSBP (109 vs 101 minutes, p=0.41), elevated edSBP (111 vs 99 min, p=0.46) or edDBP (120 vs 101 min, p=0.134). Those with severely elevated preDBP were treated with IV TPA at later time periods (122 vs 99 minutes, p=0.012).

Conclusions: Severely elevated BP did not affect rates of intravenous thrombolysis. Elevated DBPs were associated (pre) or trended toward an association (ED) with longer door to needle times. Prehospital start of antihypertensive therapy among stroke patients with severely elevated blood pressure may be able to accelerate lytic therapy start.
Cardiac Autonomic Function in Lateral Medullary Infarction
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Background: Not many studies have focused on the autonomic dysfunction of lateral medullary infarction (LMI) although the medulla contains the vasomotor regulation centers. Therefore, cardiac parasympathetic and sympathetic functions were compared in LMI patients and controls. Methods: We included LMI patients who had ipsilateral Horner’s sign without a history of diabetes, cardiac disease, or previous stroke. The battery of tests to check the parasympathetic function included beat-to-beat heart rate variation during deep breathing, 30:15 heart rate ratio testing while standing, along with the valsalva ratio. Sympathetic function tests included blood pressure during active standing, and blood pressure in response to sustained hand grip. The composite autonomic score (CAS) was measured as a total of 10 points: parasympathetic dysfunction was designated as ≥3 points in the parasympathetic subscores and sympathetic dysfunction as ≥2 points in the sympathetic subscores. Results: The mean age and stroke risk factors of the study population were not significantly different between LMI group (n=25) and control group (n=29). However, cardiac autonomic functions were significantly different in the groups: parasympathetic dysfunction (56.0 vs. 13.8%, gender-adjusted p=0.011) and sympathetic dysfunction (12.0 vs 44.8%, gender-adjusted p=0.008). Male-gender and ventral involvement of the right medulla were significantly associated with parasympathetic dysfunction (CAS subscore ≥3) and the ventral involvement was the independent predictor for parasympathetic dysfunction (OR 16.0; 95% CI 2.2-118.3, p=0.007) in the multivariable analysis. Conclusion: This study suggests that patients with LMIs appear to have frequent cardiac parasympathetic dysfunction, especially associated with the right-sided and ventral medulla.

Determinants of the practice of dual antiplatelet use in the secondary prevention of acute ischemic stroke in a Brazilian tertiary hospital
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Background: Numerous trials have confirmed the effect of antiplatelets to reduce vascular events in patients with
prior stroke. However, controversies persist about the ideal antiplatelet regimen, including the use or not of dual antiplatelet therapy. Our objective was to evaluate the determinants of the practice of dual antiplatelet use in the secondary prevention of acute ischemic stroke (AIS) or TIA.

Methods: We prospectively evaluated all patients admitted to a Brazilian tertiary hospital with AIS or TIA from February 2009 to June 2011. Groups were compared according to their antiplatelet regimens. Patients with contraindication to antiplatelets or using anticoagulation were excluded. Aspirin-Extended Release Dipyridamole is not available in Brazil. Results: We evaluated 462 patients with AIS or TIA. Of those, 178 were either using anticoagulants or had contraindication to antiplatelets. A total of 172 patients (59.3%) received aspirin alone, 57 patients received only clopidogrel (19.7%) and 61 patients (21.0%) received dual antiplatelet therapy. Patients who received combination therapy were similar to those treated with monotherapy with respect to age, severity of stroke at admission, frequency of hypertension, diabetes, coronary artery disease, and previous stroke. Patients treated with combination therapy were more frequently males (67.2% vs 54.6%, p=0.05), had more frequent dyslipidemia (42.6% vs 30.1%, p=0.04) and a history of previous TIA (9.8% vs 2.2%, p<0.01) and had a trend to be more frequently smokers (23.0% vs 15.7%, p=0.1) and to have more frequently >50% carotid stenosis (37.5% vs 15.8%, p=0.1). Only a previous TIA (OR 12.3, p=0.03) remained an independent predictor of dual antiplatelet use in the multivariate logistic regression analysis. Conclusions: Although not completely supported by the literature, the use of dual antiplatelet therapy after AIS was a common practice in our service especially in patients with a previous TIA.

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Stroke in the Young Adult: 6 year case series of Community Hospital Stroke Unit

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Background: Stroke etiology in young adults and older patient differs considerably, as epidemiology and clinical features varies according to geographical criteria. To improve clinical management and diagnostic work up of young adults with acute cerebrovascular events we analyzed retrospectively data of 6 years stroke unit case series.

Methods: The Stroke Unit at S Camillo - Forlanini Hospital is a Hub Stroke Center, it is a 8 bed residential facility managed by a multidisciplinary team with 24 hours access to laboratory facility, neuroimaging, neurosurgery and cardiology services. Population served is 1,2 mil-
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**WAKE-UP STROKES: WE HAVE NO TIME TO LOSE**

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**BACKGROUND.** About 10% of all ischemic strokes occur during sleep, mechanical recanalization with retrieval intracranial stents result in immediate flow restoration. It has been demonstrated low risk of bleeding with these devices in acute stroke patients (<6 hours), but clinical prognosis of this subgroup of patients is uncertain. We evaluate safety and efficacy data on the application of these devices in acute stroke patients.
of the thrombectomy devices in acute wake-up stroke patients in our Comprehensive Stroke Centre. METHODS: We performed an analysis of patients with acute wake-up ischemic stroke treated with thrombectomy from April of 2010 to October 2011. A 91% had an anterior circulation stroke and large mismatch was evaluated with CT-perfusion. (MTT/CBV>50%). None of the patients received rtPA previously. Over 95% cases had initial TIMI/TICI 0 by angiography. Good recanalization results were assessed by follow-up angiography immediately after the procedure (TIMI II-III). We compare good functional outcome (90 days mRankin score<3) and mortality in wake-up strokes with a subgroup of patients than received thrombectomy and rtPA previously (<4.5 h of onset treatment time) RESULTS: Twenty-one percent of patients with thrombectomy were wake-up strokes within this period. The median NIHSS score in wake-up stroke patients at presentation was 16 (range 7-23). Recanalization: (TIMI II-III) was achieved in 87%. Symptomatic haemorrhage occurred in 14%. Good neurological outcomes in wake-up strokes thrombectomy (mRankin≤2) were similar to no wake-up strokes (45% vs 48%). Mortality rates were lower (17% vs 28%) in non-wake-up strokes group compared with wake-up strokes, associated primarily with haemorrhage. CONCLUSIONS: Efficacy and safety of thrombectomy in wake-up stroke are similar to other subgroup of patients eligible for thrombectomy.

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The StrokeLink program: linking evidence to practice for stroke care in Queensland, Australia

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Background: There is growing interest in research and programs that aim to link research or guidelines to improved stroke care. StrokeLink is a team based quality improvement (QI) program launched in 2008 by the National Stroke Foundation (NSF) to facilitate reducing the gap between evidence (as outlined in the guidelines) and practice (as found in the national stroke audit).

Methods: Qualitative and quantitative methods were utilised involving three focus groups (13 participants), semi-structured interviews with key stakeholders (11 interviews with 12 participants) and a survey to all participants (39 responses received). Data was thematically analysed. Preliminary data from the National Stroke Audit was then compared to assess relevant changes in process and outcomes.

Results: The StrokeLink program has
Non-motor symptoms in stroke: A survey of patients and professionals.
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Background: Motor symptoms are easily detected after stroke but many non-motor symptoms risk to be missed in these patients. E.g. NIH Stroke Scale predominantly describes motor symptoms but many patients after stroke may react with denial, hopelessness, sorrow and other non-motor symptoms. We examined how non-motor symptoms are valued in relation to motor-symptoms among patients and professional health care personnel. Which non-motor symptoms are of greatest importance from the patients’ as well as from the healthcare-personnels’ point-of-view?

Methods: We chose 73 questions from (1) a Parkinson Disease Non-motor-questionnaire, (2) a small pilot study performed by us, (3) literature, and (4) the Riksstroke-registry. The questions addressed non-motor (n=46), mixed (n=20), and pure motor (n=7) symptoms. The questionnaire was administered in Germany and Sweden to patients and their relatives (n=130) and to professionals experienced in stroke care (n=369) (MDs. and nurses in acute hospitals, occupational therapists, speech therapists, physiotherapists, Rehab-Doctors, Rehab-Nurses) in approximately 30 hospitals.

The respondents graded each symptom into 4 categories ranging from very important to not at all important. The mean...
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Isolated anterior cerebral artery stroke: presentation, lesion, and outcome in 36 prospectively collected consecutive patients

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The anterior cerebral artery (ACA) feeds the frontomedian wall, anteroventral parts of the basal ganglia, and anterior 4/5 of the corpus callosum. Ischemic strokes are rare and account for 0.6-3% of all territorial strokes. Most knowledge on ACA-stroke stems from a few retrospective case series and case reports before the advent of neuroimaging. Routine work-up for ischemic stroke was applied in 36 consecutive patients: MRI, extracranial ultrasound, ECG, Holter-ECG, transthoracal and transeosophageal echocardiography. ACA-stroke was clinically suspected and defined by the MRI-lesion. Strokes related to neurosurgical conditions significant other lesions were excluded. Mean age was 68.5 years (range 23-85), 16 were women, 20 men. Mean acute presentation was akinetic mutism (persistent n=3, brief n=11), crural hemiparesis (n=8), sudden apathy (n=1), falls with anosognosia for falls (n=1), sudden maladaptive behavior (n=6), amnesia and mutism (n=1), sudden apathy, diarrhea and profuse sweating (n=1), and status epilepticus (n=1) contralateral hemihypoesthesia and distortion of egocentric space (n=1). Lesions were left in 19 and right in 17 patients; one had bilateral lesions. Etiology grading for each symptom was calculated.

Results: Among patients, more than half of the 20 top-rated symptoms were pure non-motor-symptoms. Of these 20 top-rated symptoms, 9 were not among the top 20 symptoms according to health personnel. These symptoms included: frequent nocturnal or sudden urination, writing difficulties, patients concerns for general health, insomnia, support needs are met, and loss of interest in daily/leisure activities.

Conclusion: Many symptoms rated as important after stroke are non-motor. The perceived importance of symptoms differs considerably between patients and health personnel. Further studies of how symptoms are valued after stroke, including validation studies are needed.

Table 1: Top 20 ranking of patients of all symptoms in relation to ranking of professionals

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Ranking Patients</th>
<th>Ranking Professional</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fatigue, Tiredness</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>Strength Arm or Leg</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Support needs met</td>
<td>3</td>
<td>67</td>
</tr>
<tr>
<td>Confused memory</td>
<td>4</td>
<td>19</td>
</tr>
<tr>
<td>Regular nocturnal urination</td>
<td>5</td>
<td>59</td>
</tr>
<tr>
<td>Difficulties in writing</td>
<td>6</td>
<td>23</td>
</tr>
<tr>
<td>Gait disturbances outdoors</td>
<td>7</td>
<td>11</td>
</tr>
<tr>
<td>Health worries</td>
<td>8</td>
<td>29</td>
</tr>
<tr>
<td>General health affected</td>
<td>9</td>
<td>27</td>
</tr>
<tr>
<td>Unpleasant loss of sensation</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>Insomnis, frequent waking</td>
<td>11</td>
<td>14</td>
</tr>
<tr>
<td>Loss of interest in activities</td>
<td>12</td>
<td>21</td>
</tr>
<tr>
<td>Concentration difficulties</td>
<td>13</td>
<td>12</td>
</tr>
<tr>
<td>Aphasia</td>
<td>14</td>
<td>6</td>
</tr>
<tr>
<td>Feelings of depression</td>
<td>15</td>
<td>52</td>
</tr>
<tr>
<td>Pain in limb</td>
<td>17</td>
<td>20</td>
</tr>
<tr>
<td>Urgent need for Urination</td>
<td>16</td>
<td>54</td>
</tr>
<tr>
<td>Gait disturbances indoors</td>
<td>18</td>
<td>15</td>
</tr>
<tr>
<td>Chillsness/ataxia</td>
<td>19</td>
<td>31</td>
</tr>
<tr>
<td>Loss of ability performing tasks</td>
<td>20</td>
<td>9</td>
</tr>
</tbody>
</table>
was mainly proximal embolism (n=30), the remainder cryptogenic. The most frequent lesion hit the dorsal anterior cingulate cortex (n=21) the corpus callosum was affected in 13 patients. Overt callosal disconnection signs were observed in 4 patients, and 12/14 patients with callosal lesion remained dependent in everyday life regardless of lesion size. Former daily activities could be resumed in 20 patients. ACA-stroke presented with behavioral trouble and disturbed complex motor integration. Left prefrontal lesions had akinetic mutism of variable duration, their counterpart had acute trouble integrating the representation of the self and the others. Prognosis seems to be worsened by callosal lesions, but otherwise more than half of the patients resumed their former daily activities.

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THE PERFORMANCE OF A CT-ANGIOGRAPHY PREVIOUS TO INTRAVENOUS THROMBOLYSIS DOES NOT IMPAIR RENAL FUNCTION.

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BACKGROUND: CT angiography (CTA) is useful to diagnose cerebral artery occlusions in patients with acute stroke before recanalizing treatment. The use of contrast agents can raise the serum creatinine levels and induce acute renal dysfunction (ARD).

Our aim is to determinate the safety of the use of CTA previous to intravenous thrombolysis (IVT) on renal function in patients with acute ischemic stroke.

METHODS: Retrospective analysis of patients treated in our hospital with IVT from January 2009 to December 2011. Baseline (before IVT and CTA) and control (within 48 hours after IVT) creatinine levels were compared. ARD was defined as an increase ≥0.5 mg/dl and/or ≥25% of baseline creatinine levels. Patients were divided into two groups: CTA performed (CTA+ group) and CTA not performed (CTA-). The indication for CTA was based on staff advice and availability of the technique.

RESULTS: 190 patients treated with IVT. Renal function (pre and post-IVT) could be assessed in 162 patients, 114 CTA-, 48 CTA+. 9 patients (5.5%) developed ARD, 7 (6.1%) in CTA- group and 2 patients (4.2%) in CTA+ group. The performance of a CTA was not related with a higher risk of ARD: OR 0.7 (IC95%: 0.13-3.3), p=0.6, and did not affect efficacy and safety of IVT. ARD was associated with previous history of Diabetes (OR=4.4 (95% CI: 1.1-17.2), p=0.03), history of Chronic Renal Insufficiency (CRI) (OR=12.2 (95% CI: 2.4-61.2), p=0.002) and baseline creatinine >1.5mg/dl (OR=5.9 (95% CI, 1.04-34.1), p=0.004). After a multivariate analysis, only history of CRI was identified as an independent risk factor for ARD.

CONCLUSIONS: CTA does not impair renal function.}

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renal function. This technique may be used safely before IVT in acute ischemic stroke.

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Somatotopy of corona radiata infarction
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Background and Objectives: Corticospinal tract is a long pathway from the motor cortex to spinal cord. Depending on the lesion location, motor symptoms and severities are variable. So we conducted a study to know topography of motor fiber depending on the severity of motor power, location (proximal vs distal), and area (face, arm, leg) in patients with corona radiata infarction.

Methods: We collected corona radiata infarction with or without basal ganglia involvement. All patients performed MRI, MRA (or CTA), and common vascular risk factors. Anterior to posterior distance (APR) was defined by LP (the distance between most lateral point of the posterior horn of the lateral ventricle and center of the lesion)/AP ratio (the distance between the most lateral points of the anterior and posterior horn of the lateral ventricle), horizontal distance (LDR) was defined by IV (the distance between margin of insular cortex and the wall of the lateral ventricle)/LV (the distance between the center of the lesion and the wall of the lateral ventricle). We checked the motor power in the proximal and distal of arm and leg as well as arm and leg motor power difference.

Results: We collected 68 patients (men: 46, women: 22, mean age: 63 years old).

The patients with facial weakness had more anteriorly located (higher APR) compared to without facial weakness (p = 0.048). Proximal and distal motor power as well as proximal and distal motor power difference in the arm and leg did not have statistically significant APR and LDR. Those patients with more higher NIHSS(>4) had more medially located (lower LDR) than lower NIHSS(0-4) in the right sided lesion (p = 0.037).

Sensory symptom was more common in the patients with basal ganglia involvement (p = 0.0021, Fisher’s exact test).

Conclusion: Fiber subserving facial muscle is located more anteriorly than those patients without facial weakness. Motor fibers more compactly located in the medially in the corona radiate. Basal ganglia involvement is associated with sensory symptoms which may suggest sensory tract may distribute rostrocaudal rather than anteroposterior distribution.

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Rapid Intervention with GTN (Glyceryl Trinitrate) in Hypertensive Stroke Trial (RIGHT): qualitative study exploring feasibility of paramedics involvement in a trial of ultra-acute
Acute stroke: clinical patterns and practice

TEMPORAL PROFILE OF CARDIAC OUTPUT IN ACUTE STROKE PATIENTS

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Background
In the last years Cardiac Output (CO)
has been noninvasively measured by cardiothoracic bioimpedance. Our aim is to describe the temporal profile of CO in acute stroke patients treated with ev tpa.

Methods
Acute stroke patients treated with ev tpa were prospectively included. CO was noninvasively and continuously measured beat to beat by thoracic bioimpedance within the 6 hours from ev treatment onset. Those patients with severe aortic insufficiency were excluded. A linear regression model showed the temporal profile of CO within the first 6 hours. Two groups were defined: patients with decremental CO slope (b<0,01) and patients with non-decremental CO slope (b>0,01). The NIHSS scale was used to assess clinical impairment before ev tpa treatment and at 24 hours. Symptomatic intracranial hemorrhage (SICH), long-term outcome (mRS</=2) and mortality were also analyzed.

Results
Thirty patients were included. There were no differences in baseline clinical characteristics including age, gender, baseline NIHSS, risk factor profile and time to treatment. See table attached. Sixteen patients (53%) showed decremental slope and 14 patients (42%) showed non-decremental slope. The 24 hours NIHSS was significantly lower in patients with decremental CO slope (4, IQR 0-16) compared to patients with non-decremental CO slope (15, IQR 7.20) (p=0.04). The were no differences in the rate of recanalization, SICH and mortality.

Conclusion
CO monitoring in acute stroke patients may be useful to predict clinical evolution in acute stroke patients. Decremental slope curve may be associated with lower 24h NIHSS score.
BACKGROUND: Stroke survivors are at high risk of recurrent stroke, community-based studies show that this risk is about 30%. Recurrent strokes tend to be more deadly than the first stroke and lead to further neurological impairment. In this study, in-hospital stroke recurrence in a university hospital stroke unit setting were investigated.

PATIENTS AND METHODS: Stroke registry data of 2128 patients hospitalized at the Istanbul Faculty of Medicine, Department of Neurology, Edip Aktin Stroke Unit between 1994-2007 were evaluated. Recurrent stroke was defined as a new neurological deficit not caused by neurological complications such as edema, mass effect or hemorrhagic transformation or progression of the index event. Clinical, laboratory and neuroimaging findings of 67 recurrent ischemic stroke patients were compared with ischemic stroke patients (n = 1658) without any recurrence. Statistical methods used were; chi-squared test for parametric variables, t-test for continuous variables and univariate and multivariate analysis using SPSS version 15.0.

RESULTS: In-hospital stroke recurrence rate was 3.9% (n = 83/2128) in all stroke patients and 4% in ischemic stroke (IS) patients. There were no statistically significant differences between IS patients with and without recurrence in terms of demographic features, and most traditional risk factors. Only peripheral vascular disease frequency was significantly higher in the recurrent stroke group (p = 0.05, 95% CI = 0.98 to 5.524). Posterior circulation syndrome (POCS) and was significantly more frequently encountered in the recurrent stroke group (p = 0.012). The most important factor in determining the recurrence of IS was large artery atherosclerosis (LAS) (p <0.001, 95% CI = 0.062 to 0.44).

CONCLUSION: In a stroke unit where acute stroke treatments were mostly unavailable, a higher in-hospital stroke recurrence rate associated with LAS in IS patients may be indicative of the importance of early therapeutic intervention.

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Physician’s attitudes towards admitting stroke patients to critical care units (CCU)

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Department of Anaesthesia, Tunbridge Wells Hospital, Tunbridge Wells, Kent, UNITED KINGDOM

Background
Stroke patients in the UK were rarely admitted to CCUs.
Stroke treatment has advanced with more potential interventions leading to stroke patients requiring more critical care.
Methods
A web based survey of anaesthetists, stroke physicians, neurologists and geriatricians through email and specialist so-
Respondents were asked to rate and comment on 4 stroke cases for CCU admission.

Results
210 doctors in the UK took part; 58% intensivists/anaesthetists, 29% stroke physicians, 8% neurologists and 6% geriatricians. 49% worked in district general hospitals, 33% teaching hospitals with or 18% without neurosurgical services. 83% had admitted stroke patients to a CCU.

Case 1: neurological deterioration in a young person with a large stroke. Stroke physicians (86%) and neurologists (86%) were more likely to consider CCU admission than intensivists (60%), anaesthetists (62%), and geriatricians (66%).

Case 2: basilar artery thrombosis. Neurologists (88%) and stroke physicians (85%) were much more likely to consider support, than intensivists (33%) or anaesthetists (52%). There was no difference in neurosurgical centres.

Case 3: post stroke pneumonia. Intensivists (62%) and anaesthetists (54%) were more likely to consider admission than stroke physicians (41%), neurologists (38%) and geriatricians (33%).

Case 4: dementia and intracranial haemorrhage with poor prognosis. The majority (97%) agreed against admission to CCU.

Themes were difficulty predicting prognosis, communication, neurosurgical decision making, rationing of CCU beds and differing referral patterns of stroke services.

Conclusions
Many physicians involved in stroke and critical care are considering critical care support for stroke patients. Decisions are affected by service and patient factors. Critical care teams need guidance from stroke teams on patient selection and should be included in planning of stroke services.

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Anteromedial medullary infarction: clinical and imagiological correlations
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Background: Anteromedial medullary infarcts are rare, representing, possibly, less than 1% of the vertebrobasilar territory lesions. Although classical syndromes have been described, such as the Déjerine syndrome, the clinical and imagiological correlations of theses lesions are not well established.

Methods: We report two patients with anteromedial medullary infarcts and describe their clinical presentations and imagiological findings.

Results: Two 62-year-old men, with hypertension and hypercholesterolemia, were admitted with motor deficits of sudden appearance that fluctuated/evolved in the following 24-48 hours. The weakness involved the contralateral face, arm, and, disproportionately, lower limb. These deficits were accompanied by sensory symptoms (with no objective findings), involving the same-sided hand (in both), superior and external region of the
INTRODUCTION
Cervical arterial dissections have been recognized as an important cause of ischemic stroke. The variety of clinical presentations is well-known, but there is a lack in international recommendations regarding treatment management. As the identification of factors influencing long-term evolution can help the clinicians, our aim was to review the acute phase parameters and correlate them with the functional status on follow-up.

METHODOLOGY
Carotid and vertebral dissection cases identified from 2004 to 2011 in a tertiary hospital were reviewed retrospectively. We analyzed the relationship between clinical, imaging or therapeutic variables of the acute phase and the functional long-term outcome (modified Rankin scale, mRS); mRS was dichotomized as 0-2 and 3-5 to determine a good or bad prognosis.

RESULTS
68 cases were identified, with a mean age of 46 years (IQR: 39-54). Twelve were vertebral dissections (17.4%). The most common clinical presentation was ischemic stroke (60.8%), followed by TIA (10.1%), isolated Horner’s syndrome (5.8%) and isolated headache (4.3%). Median NIHSS was 4 (3-13). The most common finding in acute-phase imaging procedure was stenosis (52.2%), followed by occlusion (40.6%) and pseudoaneurysm (7.2%). Thirty-five patients started anticoagulation (50.7%); 12 performed IV thrombolysis. Fifty-seven patients had mRS 0-2 and eleven had mRS 3-5. Median follow-up time was 19.7 months. We found a statistically significant association between anticoagulation and a good functional status.
Prestroke glycemic control is associated with long-term mortality in acute stroke
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Background:
Very few observational studies have assessed the association between prestroke glycemic control and clinical outcome in acute stroke patients. Therefore, the impact of prestroke glycemic control on clinical outcome is partly unknown. The aim of the present study was to examine the importance of prestroke glycemic control, defined by hemoglobin (Hb) A1c, on admission and its relationship to mortality and functional outcomes after acute stroke and TIA and after long-term (3 and 12 months) follow-up.

Methods:
 Patients admitted to the stroke unit with stroke/TIA (n=1035) were studied during acute hospital care and up to 12 months after discharge from hospital. HbA1c was examined during admission. Functional outcome was assessed by Modified Rankin Scale (mRS) at 3 months and at 12 months and mortality was recorded due to the Population registry.

Results:
Of all 1035 patients, 167 patients had diabetes and 868 patients were non-diabetics. Mean age was 78 +/- 8 years (Mean +/- Standard deviation). HbA1c at baseline was associated with all-cause mortality at 12 months (p < 0.015) independent of age, baseline NIHSS, previous stroke or myocardial infarction. There was a non-significant tendency of an independent relationship between baseline HbA1c and mRS at 3 months (p = 0.052) and between baseline HbA1c and NIHSS at admittance (p = 0.061).

Conclusion: In acute stroke patients HbA1c on admission was an independent significant predictor for increased mortality after 12 months.
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Background: Early predictors for the development of stroke-associated infection may identify patients at high risk and reduce post-stroke infection and mortality.

Methods: In a post-hoc analysis of data from a single center prospective cohort study, stroke patients with any infection, pneumonia, urinary tract infection (UTI) or other infection (OI) were identified. Blood samples were collected on admission, and days 1, and 3 to assess white blood cells (WBC), monocytes, C-reactive protein (CRP), procalcitonin (PCT), and copeptin. Odds ratios (OR) were calculated for each marker. The discriminatory ability of different predictors was compared by calculating receiver operating characteristic analysis. Prognostic models including the three parameters with the best performance were assessed.

Results: Of 383 patients, 66 (17.2%) developed an infection, 46 (12%) patients within and 20 (5.2%) beyond the first 5 days after onset of stroke. WBC, CRP, copeptin and PCT – measured on admission or on day 1, 3 and 5 after admission - were predictors of any infection, pneumonia and UTI (p<0.001) developed at least 24 hours after measurements. The combination of biomarkers (WBC, CRP and copeptin; WBC, CRP and PCT) showed a better predictive accuracy in terms of developing pneumonia during hospitalization (Wald-p<0.001).

Conclusion: Among ischemic stroke patients, copeptin, PCT, WBC and CRP measured on admission were predictors of infection in general, pneumonia and UTI within the acute phase of stroke. The combination of these biomarkers improved the prediction of patients who develop an infection.

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Vertebral artery stump syndrome in acute ischemic stroke

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Introduction: Although the role of the carotid artery stump as an embolic source for ischemic stroke has been well described, there have been very few reports of a similar syndrome causing stroke in the posterior circulation after vertebral artery occlusion (VA stump syndrome). The aim of this study was to identify the incidence and clinical characteristics of acute ischemic stroke with VA stump syndrome.
Methods: Of 2936 consecutive patients who admitted to our hospital within 7 days of onset of acute ischemic stroke between April 2007 and March 2011, 730 with acute ischemic stroke in the posterior circulation were enrolled. Patients with acute ischemic stroke in the posterior circulation on DWI and the culprit VA proximal occlusion based on duplex ultrasound, CT angiography, and/or conventional angiography, were diagnosed as having VA stump syndrome.

Results: Of 730 patients with acute ischemic stroke in the posterior circulation, 10 (1.3%) were diagnosed as having VA stump syndrome. The ischemic lesions included the cerebellum in all patients. Eight patients had multiple ischemic lesions in the brain stem, thalamus, or posterior lobe other than cerebellum. On duplex ultrasound, antegrade flow pattern in eight patients and to-and-fro pattern in two patients, were observed in the culprit VA. Brain MR angiography revealed no abnormal findings in two patients. Although antiplatelet therapy failed to prevent ischemic stroke recurrence in three patients, no further recurrence was observed after the initiation of anticoagulation therapy.

Conclusion: The prevalence of VA stump syndrome was about 1% in patients with acute ischemic stroke in the posterior circulation. Multiple ischemic lesions in the posterior circulation and the efficacy of anticoagulation therapy were important features.

Background: It is important to establish reliable and valid screening tools for post stroke cognitive impairment, particularly as stroke patients with significant cognitive impairment are at increased risk of incident dementia (Narasimhalu, 2009). We aimed to examine the predic-
Acute stroke: clinical patterns and practice

Are we neglecting “neglect “patients: Non-dominant strokes?
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‘Time is brain’ as millions of neurons are lost with every minute of stroke. This dictates the immediate recognition of stroke and rapid transfer to hospital. However there is significant time delay in recognition of dominant (D) and not dominant strokes (ND) which consecutively affect the functional outcome. Although many tools in place to recognise stroke symptoms like FAST, ROSEIR etc, none of these actually specific for non dominant strokes.

Methods:
We collected the data of stroke patients who underwent thrombolysis from our hospital thrombolysis registry (Royal Berkshire NHS Foundation Trust, one of the largest teaching hospitals in UK) for the period of 21 months from December 2009 to September 2011. 88 patients (including 35 aged >80 (very elderly mean 84.8) with stroke treated with intravenous Alteplase were retrospectively analysed. (Data on 2 patients were missing for baseline National Institutes of Health Stroke Severity score, leaving 86 patients for analysis) We then compared NIHSS at presentation, door to needle time, onset of symptoms to treatment time and outcome at 90 days using modified Rankin scale

relative ability of the MoCA and the MMSE at baseline and 3-6 months post-stroke for significant VCI at 1 year after stroke.

Methods: Patients with ischemic stroke and transient ischemic attack were assessed with both MoCA and MMSE within 14 days and at month 3-6. They then received a formal neuropsychological evaluation at 1 year which was utilised to classify cognitive outcomes as either ‘no to mild cognitive impairment (≤2 cognitive domains impaired)’ or ‘moderate to severe cognitive impairment (>2 cognitive domains impaired, i.e., significant VCI)’. Results: 173 out of 249 (69.5%) patients completed neuropsychological assessments 1 year after stroke. Of these, 137 (79.2%) had no (n=84) to mild (n=53) cognitive impairment and 36 (20.8%) had moderate (n=32) to severe (n=4) cognitive impairment. Both the total scores of MoCA and MMSE at baseline and month 3-6 were equivalent and adequate in detecting patients with significant VCI at 1 year with similar areas under the curve (baseline: 0.86; month 3-6: 0.87). Receiver Operating Characteristic (ROC) analysis established similar optimal cutoff scores of baseline and month 3-6 MoCA (≤20) (Sensitivity: 0.92-0.95; Specificity: 0.64-0.68), baseline and month 3-6 MMSE (≤25) (Sensitivity: 0.75-0.83; Specificity: 0.74-0.84) in detecting significant VCI at 1 year. Conclusion: The total scores of both MoCA and MMSE at baseline and 3-6 months are equivalent in detecting significant VCI as defined by formal neuropsychological testing at 1 year after stroke.
among dominant and non dominant stroke patients who received intravenous thrombolysis.

Results:
Main outcome measures:
The distribution of NIHSS scores was higher with dominant strokes and non dominant strokes with limb weakness. There was no statistically significant difference between doors to needle time (ND 17.5% Vs D 14 % within 30-60 mins) between these to variables. However onset to treatment time (OTT) was significantly longer (mean delay of 47 mins (range 20-70) and thereby dependency at 90 days were high (using mRS (D 17 % Vs ND 11% of mRS 0-1) compared to dominant strokes.

Conclusion:
Outcome in patients with non dominant strokes were worse compared to dominant strokes because of the time delay and it is paramount to raise the stroke awareness of the public and healthcare professionals regarding non dominant strokes. Perhaps adding visual and spatial symptoms to the FAST may be one way forward of identifying these strokes early.

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Blood Glutathione S-Transferase- pi is a time predictor of stroke onset

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Background. The determination of the precise time of stroke onset remains a key parameter in the international guidelines for thrombolytic therapies. Indeed, 25% of stroke patients are excluded from this treatment due to an unknown time of symptom onset. Here, we proposed that a blood biomarker would allow rapid and accurate determination of this time and consequently establish whether the patients are within the 3 h therapeutic window.

Methods. The blood level of 29 proteins was measured by immunoassays on a cohort of 103 stroke patients having a blood drawing within the first 36h after symptom onset (66 ischemia; 9 hemorrhagia, 19 TIA and 9 stroke with unknown origin) and 132 control patients. Mann-Whitney U tests, ROC curves and diagnostic odd ratios were applied to evaluate their clinical performances.

Results. GST-pi concentration was the most significantly (p<0.001) elevated marker in the blood of stroke patients. More importantly, elevation of GST-pi
concentrations occurred in early (samples collected within the 3h after stroke onset, N=22) compared to late (samples collected between 3 and 36h after stroke, N=80) stroke patient admission at the emergency room. The GST-pi concentration rapidly decreased beyond 3h to reach normal level, already 6h after the stroke onset. With a SP-oriented cut-off value (65 µg/L), GST-pi discriminated early vs. late stroke patients with 91% specificity for 50% sensitivity.

Conclusions. This study indicated that GST-pi can predict the time of stroke onset with the detection of 50% of early stroke patients (admitted within the first 3h after symptom onset). The GST-pi test could therefore efficiently complement current guidelines for tPA administration and potentially increase the number of patients having access to thrombolysis.

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Unilateral asterixis as the presenting sign of acute lateral thalamus ischemia
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Background: “Asterixis” is an abrupt, brief and arrhythmic interruption of tonic muscle activity. Though asterixis is most commonly bilateral and mainly related to a diffuse encephalopathy, the unilateral asterixis has been reported in association with structural lesions of the central nervous system (CNS).

Case reports: We present three patient referred to the emergency department complaining of unilateral weakness. On neurological evaluation, when keeping the arms outstretched, unilateral irregular flexion movements of the fingers and wrist were observed, which were enhanced by wrist and fingers hyperextension. Segmental and global muscle strength of the symptomatic upper limb was normal, but slight weakness of the ipsilateral lower limb was identified. The sensory examination was unremarkable. In one case there was also hemiataxia and in another case a homonymous hemianopia was found. The brain imaging showed, in all patients, recent ischemia in the lateral thalamus (ventral lateral and lateral posterior nuclei) and medial posterior limb of internal capsule. In the patient with visual field deficit, there were also signs of acute infarction in ipsilateral parieto-occipital region and cerebellar hemisphere. One patient underwent electrophysiological evaluation: electromyographic recording of the extensor digitorum communis fingers confirmed negative myoclonus (silence period between 45-69 ms) and somatosensory evoked potentials were normal.

Conclusion: Sudden unilateral “asterixis” should suggest a focal lesion in the CNS. In the majority of the cases the cause is a lateral thalamic ischemic lesion, as in our cases. However, a literature review shows other brain regions and other causes related to the same semiological finding. We would like to stress this rare presentation of stroke, as this subtle manifestation can be overlooked.
The aim of our study was to evaluate hemodynamic pattern of LSS with RRHS.

Methods

We performed cerebral single-photon emission computed tomographic (SPECT) to evaluate CBF in 8 patients (44-88 years old) with a LSS when lying down and standing. Significant stenosis or occlusions were located in ICA in 7 patients, and in basilar artery in 1 patient. None had orthostatic hypotension.

Results

In all patients lying down CBS decreased in the ipsilateral cerebral tissue of the vascular lesion. When standing up, SPECT showed a contralateral reduction of CBF (i.e. steal phenomenon). All patients had an incomplete polygon of Willis on vascular imaging.

Discussion

Most studies using cerebral SPECT showed that LSS was an emergency symptom resulting from reduced CBF among downstream stenosis or occlusion. It associates perturbation of cerebral vascular autoregulation with drastic lowering vascular reserve. Our 8 cases showed a CBF reduction in the side without vascular lesion when standing up. Incomplete Willis polygon may explain the difficulty of improved collateral activity in such situation.

Conclusions

Positional SPECT can identify subjects with vascular lesions with a risk of hemodynamic deficiency. This mechanism call RRHS can explain some LSS. Appropriate therapeutic measures should be: bed resting, keeping blood pressure at high level and, if possible, a revascularization procedure.
The influence of initial hyperglycaemia on stroke outcome after intravenous thrombolysis

Serbian Experience with Thrombolysis in Ischemic Stroke - SETIS register

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Background – Admission hyperglycemia has been claimed to be associated with increased risk of death, symptomatic ICH (sICH) and disability outcomes. The aim of this study was to evaluate the impact of an initial glucose level on the rate of hemorrhagic transformation (HT), neurological worsening and functional outcome in stroke patients treated with intravenous thrombolysis (IVT).

Methods - Serum glucose was determined at baseline in 607 acute stroke patients treated with IVT in 4.5 hour time window. Hyperglycemia was defined as a glucose level >7 mmol/l. The evaluation of neurological deficit with NIHSS scores was obtained at baseline and 24 hours. The presence of HT was recorded on delayed head CT. Symptomatic ICH was defined according to the ECASS III definition. Modified Rankin Score (mRS) was used to assess the outcome at 3 months.

Results - At admission, 44.2% patients had hyperglycaemia (range 7.1-23.2 mmol/l). The mean baseline NIHSS score was higher in hyperglycemic than normoglycemic group (14.1+/−5.6 versus 12.1+/−6.3, respectively; p=0.006). The baseline glucose level was negatively correlated with the degree of improvement at 24 hours after thrombolysis (r = −0.127; p=0.002). The initial hyperglycemia had a significant influence on neurological worsening (NIHSS≥4) in first 24 hours after thrombolysis (OR 2.43; 95% CI, 1.43 to 4.14). HT was more often recorded in patients with hyperglycaemia (OR 1.55; 95% CI, 1.03 to 2.34). More important, hyperglycemia predicted occurrence of sICH (OR 3.88; CI 95%, 1.41 to 10.7). The admission glucose level >7.0 mmol/l predicted poor outcome (mRS 3 to 6) at 3 months (OR 2.24; 95% CI, 1.59 to 3.16), even after adjusting for baseline characteristics (OR 1.55; 95% CI 1.01 to 2.40).

Conclusion - The initial hyperglycaemia is associated with occurrence of sICH and poor outcome in stroke patients treated with IVT.
Background: Aphasia affects one third of acute stroke patients. There is a spontaneous recovery but half of the patients still have aphasia after one year. A randomized controlled trial (RCT) with acute speech and language therapy (SLT) has been performed and this study correlates the effect of SLT with the location of cerebral infarction.

Methods: The RCT with acute SLT versus controls for 3 weeks included 123 acute stroke patients. A CT-scan was performed acute and after 3 weeks, 75 patients were examined at three weeks. Each CT-scan was evaluated blinded for the result of SLT, volume and location of the infarct was measured. To evaluate the degree of aphasia Amsterdam-Nijmegen Every Day Language Test (ANELT) was used acute and at 3 weeks. ANELT, a functional test, score 1-5. An improvement >1 was considered clinically significant. The therapy used was Language Enriched Therapy.

Results: The volume was median 15 ml (range 0-150 ml). There was a significant relation between ANELT at 3 weeks and infarct volume (p<0.01). The location of the infarct was in the Wernicke’s area in 36 patients, in the Broca’s area in 31 patients and in both in 13 patients. In 5 cases there was no visible infarct at 3 weeks. Among those 23 patients with an infarct in Wernicke’s area 8/13 in the SLT treated group had a significant improvement compared to 2/10 among controls (p<0.05).

Conclusion: Patients with radiologically proven cerebral infarct involving Wernicke’s area with or without infarctions centrally benefit from early intensive speech and language therapy.

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Course of body temperature in the first 24 hours after admission for acute stroke

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Background:
Increase in body temperature within the first hours to days after stroke is associated with poor functional outcome. Knowledge of the timing of this increase could have implications for intervention studies. We aimed to study the course of body temperature in the first 24 hours after admission for acute stroke.
Methods
We analyzed data of consecutive patients with ischemic stroke or intracerebral hemorrhage, admitted to our stroke unit within 12 hours after onset of symptoms, between January 1 and May 6, 2011. Body temperature was measured on admission and at 6, 12, 18 and 24 hours thereafter. Changes in body temperature at each time point were analyzed with a two sided t-test. A multivariable linear regression model was used to adjust for age, sex, stroke type, NIHSS score on admission and onset to door time. Results were expressed as delta, with 95% confidence interval (CI).

Results
Data of 50 patients were analyzed. Twenty-six patients were male (52%), their mean age was 63 years and 42 patients had ischemic stroke (84%). Mean body temperature on admission was 36.5 degrees Celsius. Body temperature increased to 36.8, 36.9, 36.9, and 37.0 degrees Celsius at 6, 12, 18 and 24 hours after admission, respectively. There was a significant increase in body temperature in the first 24 hours after admission (delta 0.48; 95% CI 0.29 to 0.66 degrees Celsius; Figure 1). Most of this increase occurred within the first 6 hours (delta 0.28; 95% CI 0.12 to 0.46 degrees Celsius). Adjustment for other factors did not influence this increase.

Conclusion
In the first 24 hours after admission for acute stroke, body temperature increases with 0.5 degrees Celsius. Most of this increase occurs in the first 6 hours after admission. The Paracetamol (Acetaminophen) In Stroke 2 (PAIS 2) trial will assess whether prevention of this increase with high-dose paracetamol will improve functional outcome.
ous monitoring of sleep positions, at the first night after admission. OSA severity was measured by the apnea-hypopnea index (AHI) and Stroke severity by the NIHSS. Results: We studied 66 consecutive stroke patients (51.5% ischemic). The mean age was 57.6 +/- 11.5 and the mean body mass index (BMI) was 26.5 +/- 4.9. Obstructive sleep apnea (AHI ≥5) was present in 78.8% and the mean AHI was 29.7 +/- 26.6. The majority of subjects (66.7%) spent all the sleep time on supine position and positional OSA was clearly present in other 23.1% of cases. There was a positive correlation between the NIHSS and the sleep time on supine position (r=0.5; p<0.001). Conclusions: Supine sleep and positional OSA are highly frequent in patients with acute ischemic or hemorrhagic stroke. The repositioning of stroke patient in the acute phase may be useful to reduce the negative impact of OSA on stroke outcome.

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The Challenge of Patient Selection for Decompressive Hemicraniectomy in Malignant MCA Infarction
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Background:
There is clear guidance for patient selection for decompressive hemicraniectomy following middle cerebral artery (MCA) ischaemic stroke (‘malignant’ MCA stroke). These include age (60 years or under); referral within 48 hours of symptom onset; normal pupil responses at time of initial assessment. Despite this, patient referrals are often inappropriate – often made too late, or with insufficient information. At our tertiary Neurosciences centre there has been an agreement that all such patients will be discussed first with the stroke team who will then liaise with neurosurgical colleagues.

Aim:
To audit referral patterns and resulting practice to inform a revised protocol for cohesive management of malignant MCA infarction patients.

Method:
Interrogation of referrals for hemicraniectomy following stroke from our locally held neurosurgical referral database from January 2009-February 2011.

Results:
72 cases were identified: 34 were male; 15 cases from the base hospital. 29 patients were aged 60 and above. Where onset time was available, 46/69 were referred within 48 hours. NIHSS scores were available for only 14 patients, with only 5 having their NIHSS 1a score documented specifically. At the time of referral, 42 patients had recorded pupil responses – abnormal in 22 cases. In 38 cases there was advice for further discussion with the stroke team, with evidence this happened in only 6. 3 patients went on to have decompressive hemicraniectomy. A further 6 patients were identified who would have appeared suitable candidates for the procedure.

Conclusion:
Despite clear national guidance, referral
patterns are chaotic, often with insufficient information and often too late for the procedure to be considered. We have devised a formal referral pathway for adoption by the neurosciences centre and distribution through our local Stroke Network to our referring centres. We will repeat our audit 12 months after the pathway has been approved and distributed to assess impact.

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Efficacy and Cost effectiveness of TIA Clinic in Stroke treatment in 1 year
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Objective: Stroke is the number one cause of Adult disability and Number three cause of death, it can be prevented by early diagnosis and treatment of underlying etiologies. Up to 60 to 70% Transient Ischemic attacks (TIA) precede strokes, 15 to 20% stroke follow TIA in 2 weeks and as much as 30% in 30 to 90 days. We evaluated the effectiveness of TIA clinic in preventing stroke and its cost.

Background: In TIA clinic patients were seen within 24 hours of symptom onset. All necessary studies including Neurological Examination/Cardiac monitoring, Scans, Laboratory workup, Angiography, echocardiogram, ABCD3 Score, Stroke education were done as well as Treatment plan started before discharge. Patient Subsequently followed in the Neurological clinic.

Method: 220 patients were treated. ABCD3 Score >5 86%, 3-5 10%, 1-3 4%. Male 85%, female 15%. Hypertension 88%, Hyperlipidemia 76%. Diabetes 56%, Atrial fibrillation 26%, Patent foramen ovali 8%, Carotid stenosis >60% (30% symptomatic, 12% asymptomatic) sleep apneas 5%. Small infarction on MRI Scan 42% small infarctions, Smoking alcohol abuse 48%, autoimmune disorder 11%, Miscellaneous 2%. Single patient may have more than one risk factors.

Results: Patient were treated antiplatelet drugs (aspirin, Plavix, Aggranoux and anticoagulation were appropriate. 60 patients underwent carotid endarterectomies and 8 patients Stenting. 2 patients had stroke and 15 patients had recurrent TIA but resolved with further adjustment of medications.

Conclusion: TIA clinic is highly effective in preventing stroke in one year even in patients with high ABCD3 Score and it is cost saving in direct medical cost including hospitalization, rehabilitation and Nursing home placement.

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Early screening for glucose intolerance and diabetes after minor stroke and transient ischemic attack. Can it give us a head start on secondary prevention?
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Background – Diabetics have an increased risk of stroke and poorer prognosis when affected. Even in the pre-diabetic state of impaired glucose tolerance (IGT) there is evidence of increased risk. Intensive lifestyle changes and/or pharmacologic treatment can, when successful delay manifestations of atherosclerosis. When screening for diabetes in a stroke population, up to 40% new diabetics are found. But for the majority of patients, the hyperglycaemia seen in the acute phase is transient when re-evaluated. Our aim was to study glucose tolerance in the acute and convalescent phase of minor stroke and transient ischemic attack (TIA) with the first control at one month. The study is an ongoing prospective observational study for 5 years.

Methods – Glucose intolerance was measured with an oral glucose tolerance test (OGTT). Patients without known diabetes, able to perform OGTT were included. OGTT, fasting plasma glucose and HbA1c were evaluated both on admission and after 1 month and 81/86 included patients did both OGTTs.

Results – Mean age of the population was 68 years and 60% were male. Mean time from clinical onset of symptoms and OGTT was 2.5 days. On admission 69% had abnormal glucose tolerance. After 1 month this percentage was 38%. A small group of 7 patients (9%) showed a poorer result after 1 month compared to baseline. There were no significant differences in the baseline data between these patients and the rest.

Conclusion – Persistent impaired glucose tolerance was seen in almost 40% of the patients and a small group had progressing intolerance. The current results indicate a possible gain in early screening for impaired glucose tolerance in an acute stroke population and the need for continued monitoring of those with pathological glucose tolerance.

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Incorporating stroke research into daily clinical practice resulting and subsequent increase in patient recruitment – experience and ideas from a successful stroke unit.


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Introduction

Comprehensive Local research networks (CLRN) were created by the National Institute of Health Research (NIHR) to provide the infrastructure to support study involvement in the NHS. Essex and Hertfordshire CLRN Launched in 2008 is committed to involve stroke portfolio studies. All trusts in this CLRN are part of the Thames Stroke Research Network (TSRN). The Main objective is to meet the NHS operating Framework goal by increasing the number of patients recruited into NIHR CRN portfolio adopted studies. Southend Hospital has the highest number of recruitment among the trusts involved in TSRN which is one
of the leading stroke research networks across the UK.

Methods
Southend University Hospital has incorporated stroke research into daily clinical practice resulting in successful increase of patient recruitment. A dedicated stroke research team participate in daily ward rounds and multidisciplinary team meetings.

Stroke trials are divided into hyper acute (IST3, DIAS4) acute (SOS, CLOTS3 and TARDIS), non acute (CADISS, DNA Lacunar & ACST2), rehabilitation (TOMAS).

Hyper acute and acute stroke trials are time specific. Patients are recruited within a pre set time since their onset or admission according to protocol. Since the implementation of a dedicated stroke research doctor covering weekends, patient recruitment has increased significantly. Open stroke trials are discussed in weekly research meetings and those most appropriate for our clinical practice are implemented.

Telemedicine is the most up-to-date technology which allows early assessment of patients out of hours, improving patient care and research recruitment.

Results
Before 2007 no patients were randomised into stroke portfolio trials in Southend hospital. The number increased significantly over next 5 years (2007-2008: 25, 2008-2009: 54, 2009-2010:106, 2010-2011:147 patients) with a total number of 332 till date (15/01/2012).

Conclusion
To maximise the number and quality of research a dedicated research team is required who will work side by side with daily clinical practice which is essential to improve NHS health care to provide better care for our future generation.

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Wake-Up Intracerebral Hemorrhage: Clinical characteristics, hematoma features, and outcomes
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Aims: Wake-up ischemic stroke has been noticed as an ineligible condition for intravenous thrombolysis and its clinical profiles has been gradually clarified. In contrast, wake-up intracerebral hemorrhage (ICH) is generally understudied. The purpose of this study was to determine baseline characteristics, hematoma features, and outcomes of patients with wake-up ICH as compared to those developing ICH during awakening.

Methods: We enrolled consecutive ICH patients admitted within 24 hours after onset between 2004 and 2009. Wake-up ICH was defined as ICH in which symptoms were recognized on awakening by a witness or by the patient. Outcomes were hematoma enlargement within the initial 24 h defined as >33% increase in the volume on CT, favorable outcome at hospital discharge assessed by the modified Rankin Scale <\=2 and in-hospital death.

Results: Of 367 patients (125 women,
69±11 years) studied, 34 patients (9.3%, 12 women, 69±11 years) were diagnosed as having wake-up ICH. History of prior stroke (35.3 vs. 20.4%, p=0.045) and prior use of oral antithrombotic agents (38.2 vs. 22.2%, p=0.036) were more common in the wake-up ICH patients than the others, while other risk factors, comorbidities, and prior uses of statin and antihypertensive agents were similar between the two groups. The median initial NIHSS score was 11.5 in the wake-up ICH patients and 12 in the others (p=0.74) and the initial hematoma volume was 20.2±28.7 ml and 20.6±30.3 ml (p=0.62). Outcomes did not differ between the groups; hematoma enlargement was identified in 2.9% of wake-up ICH patients and 9.0% of the others (p=0.23), favorable outcome in 64.7% and 69.7% (p=0.55) and mortality in 2.9% and 6.3% (p=0.43).

Conclusions: Baseline characteristics, hematoma features, and outcomes were generally similar between patients with wake-up ICH and those developing ICH during awakening, except for high tendency of histories of stroke and antithrombotic medication in patients with wake-up ICH.

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IMAGING OF CEREBRAL ARTERIES PREVIOUS TO INTRAVENOUS THROMBOLYSIS: DELAYS IN THE TREATMENT PROCEDURE OF DIFFERENT TECHNICAL APPROACHES.

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Background: Information on cerebral circulation status may be important when considering thrombolytic treatment. CT angiography (CTA) and Neurosonology (NS) have proven to be useful for detection and localization of arterial occlusion. Our aim is to determine if the performance of CTA or NS previous to intravenous thrombolysis (IVT) in acute ischemic stroke is associated with a delay in the treatment time, and if it supposes any difference in functional outcome and complications rate.

Patients and Methods: Patients with acute ischemic stroke, treated with IVT in our Stroke Unit from January 2009 to December 2011. We compare treatment delays, functional outcome at 3 months, rate of symptomatic intracerebral hemorrhage (SICH) and mortality. 3 different situations were considered: patients to whom only a plain CT was performed previous to IVT (PCT group), patients investigated with CTA, and NS group. The indication for CTA or NS was based on staff advice and availability of the technique.

Results: 190 patients were treated with IVT. 100 PCT, 55 CTA, and 45 NS. Baseline NIHSS score: median (IQR): PCT: 13 (8-17), CTA: 14 (8-18), NS: 14.5 (11-18), (p=0.47). Delays in minutes, median (IQR): “Onset-to-Door”: 120±20, 120±20, 150±20, (p=0.36). Functional outcome at 3 months: PCT 59.9%, CTA 62.6%, NS 69.0%, (p=0.29). Symptomatic intracerebral hemorrhage: PCT 6.8%, CTA 13.9%, NS 12.3%, (p=0.29). Mortality: PCT 4.6%, CTA 6.4%, NS 12.3%, (p=0.17).
Background: The prognostic impact of admission CRP levels in acute stroke patients undergoing thrombolysis is unclear since conflicting reports exist. We sought to analyze the predictive value of CRP levels for outcome and hemorrhagic complications in a large cohort of patients.

Methods: From 1998 to 2011, all patients in our institution undergoing thrombolysis for acute ischemic stroke were included into our database. Baseline variables, clinical, radiographic and laboratory data were collected prospectively. Outcome measures included symptomatic intracranial hemorrhage (sICH) per ECASS II criteria, mortality and mRS at three months and logistic regression was performed to identify independent predictors for sICH and poor outcome (mRS ≥5). Results: 1292 patients were included in the database. 38 patients were excluded due to missing CRP admission values. Mean admission CRP levels were 5.26±0.44mg/dl (range: <2-203.5) and 19.5% (245/1254) of patients had elevated CRP levels (>5) by laboratory definition. Those patients had significantly higher baseline and discharge NIHSS scores, more pneumonias and septic complications within the hospital stay and an increased risk of death and poor outcome after 3 months, while sICH rates were not increased. Between day 1 and 7, 81.5% (706/814, 478

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Admission CRP-Levels are not an independent predictor of symptomatic intracranial haemorrhage and poor outcome in thrombolized acute stroke patients

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In gradient echo imaging (GRE), susceptibility vessel sign (SVS) appear as visible vascular hyposignal that exceed the diameter of the vessel (blooming effect), it results from the presence of an intra-arterial thrombus that is rich in deoxyhaemoglobin. According to the studies carried out using T2*, an SVS could be related to the cardioembolic etiology of the stroke or to a semi-recent thrombus resistant to fibrinolysis. Our objectives were to evaluate the sensitivity of susceptibility weighted imaging (SWI) in the visualisation of SVS, to consider whether SWI enabled a better understanding of the importance of SVS, and to compare cerebral circulation regulation profiles according to the localisation of the SVS (i.e. proximal or distal). To this end, we retrospectively studied the clinical and imaging data of 78 patients admitted for acute cerebral ischaemia to the neurovascular unit of Besançon University Hospital between 1 April 2009 and 31 January 2010. SWI was more sensitive than T2* (91% vs. 31.8% when there was an occlusion of the middle cerebral artery (MCA)). Our study shows that the small number of SVS visualised using T2* in the previous studies was probably more closely linked to a lack of sensitivity in the sequences than to the nature or age of the thrombus. The greater sensitivity of SWI in detecting SVS seems to be linked to the visualisation of SVS in cases of small thrombi (100% vs. 91%).

Conclusions: Admission CRP levels are not an independent predictor of sICH poor outcome and in acute stroke patients undergoing thrombolysis. Follow-up CRP levels between day 1 and 7 remain a weak but independent predictor.

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The advantages of susceptibility weighted imaging in the acute phase of cerebral ischaemia

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Background: Despite the need to include stroke patients in clinical trial to improve knowledges of pathophysiology and to assess new therapeutic strategies, the obtainment of consent remains a problem because of motor and cognitive consequences of stroke. This situation explains that consent is often obtained indirectly from a proxy decision-maker. Identification of factors associated with a direct or an indirect consent could improve information and recruitment of stroke patient in an emergency context.

Objective: The aim of the study was to identify factors associated with the need to obtain consent by a proxy decision-maker to propose red flags before inclusion in clinical trial avoiding to include patients unable to give their own consent.

Methods: Among patients included in Biostroke cohort (PHRC 2004), two groups have been defined: a group of patients who gave directly their consent to participate; a group with consent obtained from a proxy decision-maker. Different parameters have been compared between the two groups using univariate analysis: demographic data, type of stroke, severity (NIHSS, Rankin scale), pre-stroke cognitive status (IQ-code), etiology of stroke.

Results: A total of 201 patients have...
been analyzed. Among them, 119 patients have directly given their consent while for 82 patients the consent was obtained from a proxy decision-maker. Patients with indirect consent were more aged (71 vs 64, \( p < 0.001 \)), have a more severe stroke (77% vs 17%, \( p < 0.001 \)), have more often an aphasia (61% vs 13%, \( p < 0.001 \)) and a pre-stroke cognitive impairment (58% vs 35%, \( p < 0.003 \)). The post-stroke disability and cognitive impairment were more severe in patient given their consent through a proxy decision-maker.

Conclusion: Age, aphasia, severity of stroke and pre-stroke cognitive impairment are factors that should alert investigators to rapidly contact family to obtain consent if they want to include a patient in a clinical trial.

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Interdependence of Stroke Outcome Scales: availability of reliable estimates from the Virtual International Stroke Trials Archive (VISTA)

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Background:
Clinical deficits from stroke are diverse, prompting measurement in trials by a range of outcome scales. Although one scale is usually chosen as the primary outcome measure, there can be statistical and clinical advantage in combining scales into a global outcome, as used by the NINDS rtPA trial. Greater statistical advantage is gained from combining measures that are weakly correlated yet published information on these relationships is surprisingly limited. Current literature gives divergent estimates on the degree of correlation and derives primarily from small single-trial cohorts. Case mix will influence these estimates. We aimed to clarify the interdependence of outcome scales using data from an extensive range of acute trial populations.

Methods:
We calculated correlations between modified Rankin Scale (mRS), NIH Stroke Scale (NIHSS) and other salient outcome scales at 90 days post stroke from up to 11,970 patients from the Virtual International Stroke Trials Archive (VISTA), using Pearson or Spearman-Rank correlation coefficients for continuous and ordinal outcome measures respectively.

Results:
The mRS at 90 days post stroke (mRS90) explained 74.8% of the NIHSS at 90 days post stroke (NIHSS90), 84.8% of the Barthel Index (BI90) and 86.5% of the European Stroke Scale (ESS90). NIHSS90 explained 69.3% of the BI90, 81.2% of the Scandinavian Stroke (SSS90) and 66.7% of the Glasgow Outcome (GOS90) scales.

After adjustment for age and baseline NIHSS, mRS90 explained 46.8% of NIHSS90, 68.0% of BI90. NIHSS90

Poster Session Blue 673 Lisbon, Portugal 2012
Effectiveness and safety of intravenous tPA dosing based on weight estimation of acute ischemic stroke patients.

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Background: Dose of 0.9 mg/kg of intravenous (iv) tPA has proven to be beneficial in the treatment of acute ischemic stroke (AIS). Iv tPA dosing is often based on patient’s weight (PW) estimation, which may lead to dosing errors. Our aim is to evaluate the accuracy of PW estimation and assess the effectiveness and safety of the “true dose” (TD) of iv tPA.

Methods: prospective study of patients with AIS treated consecutively with iv tPA in our institution from may 2010 to December 2011. tPA dosing was calculated according to PW estimation. Patients were weighted in the 24 hours following iv tPA treatment, and TD was calculated. Results: 108 patients included. TD could be calculated in 97. Globally, PW was overestimated: mean (±SD) 2.18Kg (5.14). Mean (±SD) TD was 0.922mg/kg (0.08), ranging from 0.61 to 1.18 mg/kg. No significant differences were observed between mean TD of patients who presented good functional outcome at 3 months (measured as modified Rankin Scale ≤2) and those who did not, and between patients who died and survivors. A higher mean TD was related with hemorrhagic transformation (HT) (0.971 Vs 0.925mg/kg, p=0.028), but not with symptomatic HT. A multivariate analysis showed an increased risk of HT per each 0.1mg/kg tPA dose increase: OR=2.98 (95% CI: 1.1-8.1, p=0.03), adjusted for age, sex, baseline NIHSS, pre-treatment systolic blood pressure and glycemia, and onset-to-treatment time.

Conclusions: Iv tPA dosing based on PW estimation leads to dosing errors that may increase HAT risk and affect the safety of the treatment. Standardized weighing before iv tPA should be considered.
Elongated styloid processes (> 3 cm) are the cause of symptoms observed in Eagle Syndrome. Eagle described two paths of clinical presentation: the first one, known as classic syndrome, is characterized by facial and neck pain and dysphagia; the second, the stylocarotid syndrome, is related to the compression of the carotid artery, and there are rare reported cases of unilateral dissection of this artery. CLINICAL CASE Male, 56 years old. History of sporadic headache, bilateral, slight, sometimes with cervical irradiation. No history of major or minor trauma. He goes to the Emergency Room referring decreased sensitivity of acute onset of the left upper limb. Objectively: left central type facial palsy, slight dysarthria, incomplete left-sided Horner’s syndrome, without other changes. Cerebral CT: hypodense areas, cortico-subcortical, in the territory of the right middle cerebral artery, that indicate acute strokes. The CT angiography revealed cervical bilateral carotid dissection: subocclusion of the right carotid artery and the formation of pseudoaneurysm in the left carotid artery; elongated styloid processes (> 5 cm) in contact with both carotid arteries. Of the remaining study stands out: normal levels of alpha1-antitrypsin; normal immunological study; cerebral angiography without evidence of vasculitis or fibromuscular dysplasia.

DISCUSSION Approximately 4% of the population has elongated styloid processes, although only 4-10% of these present symptoms. There are several cases of self-limited focal neurologic signs described in patients with Eagle syndrome; the association with carotid dissection is rarer and its occurrence is related to forced and sustained cephalic rotation movement. In this case the patient does not present such an association; however, CT images are quite elucidative, with the elongated styloid processes in clear contact with the point where it starts the vessel dissection.

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Predictive value of NIHSS measured at different time after acute stroke for disability at 3 months: a sub-study of the CHInese Medicine Neuroaid Efficacy on Stroke recovery (CHIMES) Trial

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CHInese Medicine Neuroaid Efficacy on Stroke recovery (CHIMES) Trial Investigators

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Background
The National Institutes of Health Stroke Scale (NIHSS) has been shown to be a predictor of both short and long term outcome of stroke patients. However, its predictive value when measured at different times after stroke onset has not been widely investigated. The aim of this study is to determine if clinical outcome after acute stroke is more predictable based on a delayed measurement of NIHSS.

Methods
We examined the predictive value of NIHSS scores at 2 different times (\(\leq 24\) hours vs. >24 hours) from stroke onset for the modified Rankin Scale (mRS) score at 3 months in patients randomized to the Placebo group of a double blind, randomized controlled trial to evaluate Neuroaid on stroke recovery. Patients had cerebral infarction with an intermediate range of severity (6 \(\leq\) NIHSS \(\leq\) 14). Odds Ratio (OR) of NIHSS was estimated using ordinal logistic regression for each delayed time of NIHSS assessment. Interaction was also tested in an overall regression analysis.

Results
There were 448 patients on Placebo included in this analysis. Among them, 389 (86.8\%) were randomized >24 hrs and 59 within 24 hours after onset of stroke. The mean (SD) baseline NIHSS score was 8.3 (2.5). The mean (SD) mRS at 3 months was 1.8 (1.5) and median was 1. Eleven (2.7\%) died. After adjustment for age and gender, the cumulative OR of NIHSS for poorer mRS scores was 1.28 (95\% CI: 1.04 - 1.58, \(p = 0.02\)) in those patients recruited \(\leq 24\) hours and 1.49 (95\% CI: 1.36 - 1.62, \(p < 0.001\)) when recruited >24 hours, respectively. Furthermore overall regression including all patients showed a statistically significant interaction effect between baseline NIHSS score and delayed time to randomization (\(p = 0.006\)).

Conclusion
Delayed measurement of NIHSS after 24 hours of onset of stroke is more predictive for mRS at 3 months than NIHSS measured within 24 hours of stroke onset.

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Subgroup analysis of peri-procedural aspects from a retrospective multicenter study of Solitaire™ device used in the treatment of acute ischemic stroke.

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Purpose: Provide clinical and procedural data on the Solitaire device for mechanical thrombectomy when used as 1st choice device in the treatment...
of patients with acute ischemic stroke. To date, there is no consensus on the peri-procedural aspects of mechanical thrombectomy (MT). Methods: A retrospective data collection on consecutive patients presenting with AIS treated with Solitaire device as first intention device to restore blood flow in 6 experienced European sites from March 2009 to June 2010. Patients were treated according to the hospitals’ stroke protocols (direct IA, bridging IV t-PA/IA and failed or contra-indicated IV t-PA). An independent Core Lab evaluated TICI scores on angiograms. Favourable functional outcome was defined as modified Rankin Scale (mRS) score ≤ 2 at day 90. Results: Of the 206 patients treated with Solitaire device, the device was used as first line treatment in 141 patients (mean age, 66; median NIHSS, 18). 74 patients were treated with IV t-PA prior to endovascular treatment, 56 had contra indication to IV t-PA and 11 were directly treated IA. The revascularization success independently evaluated was 85% (>TICI 2a). Favorable clinical outcome was found in 55% of all patients. Sub group analysis on results according to administration or not of IV tPA pre use of Solitaire device was performed. An increase of favorable clinical outcome was found in the sub group receiving any additional IV tPA (66% vs 42%). Proximal protection led to a significant decrease of collateral infarction. Conclusions: This retrospective, uncontrolled study shows the positive effect of Solitaire device in treatment of patients with acute ischemic. The subgroup of patients receiving IV t-PA showed an increase of favorable clinical outcome compared to the patients receiving MT only and a decrease of collateral infarction using proximal protection.

Acute stroke: current treatment

Association Between Dynamics of Haemostatic Markers and Clinical outcome, Hemorrhagic Transformation and Mortality in Acute Stroke Patients Treated with rt-PA


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mostatic markers level and clinical outcomes and hemorrhagic transformation (HT) rate in acute stroke patients after IV rt-PA treatment.

Methods. Consecutive acute stroke patients treated with IV rt-PA according NINDS protocol were included prospectively in 2 centers. Symptomatic HT (sHT) rates was defined according to ECASS III criteria and calculated from CT scans done 22-36 hs after IV rt-PA and also from any additional post-treatment scans. Mortality rate as well as number of patients with favorable outcome (mRs score 0-2) were also calculated. A blood samples were obtained at admission, in 2 hs after rt-PA, in 24 hs, 3 and 7 days after stroke onset to measure plasma levels of Fibrinogen [Fn (mg/dl)], D-dimer [Dd (ng/ml)], APTT (sec), Protein C, Antithrombin III. The associations between these factors and clinical outcomes, sHT and mortality rates were investigated using the binary logistic regression analysis.

Results. Of the 181 patients (mean age: 63.3; 64% male; median admission NIHSS score 13) 46% had mRs0-2 after 3 months, sHT rate 4.9%. Mortality rate after 3 months was 17%. High pretreatment Fg level (more than 423 mg/dl) was significantly associated with an increased risk of mortality (OR 1.75, 95% CI1.46-2.05, p=0.006) and sHT (OR 2.64, 95% CI1.8-7.03, p=0.001). Fg level less than 330 mg/dl and Dd level more than 250 ng/ml were associated with favorable outcome (p=0.008 and p=0.049 respectively). No associations were found for other markers.

Conclusion. Increased Fg level as an acute phase protein before IV rt-PA is associated with poor outcome and might be indicative of severity of ischemic lesion. Probably activated fibrinolysis before rt-PA can be appeared cause of increased pretreatment level of D-dimer in patients with favorable outcome.

662 Acute stroke: current treatment

A comparison of different thrombolytic drugs, doses and routes of administration in the treatment of acute ischaemic stroke

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Background: Thrombolysis reduces poor functional outcome after acute ischaemic stroke but at increased risk of intracranial haemorrhage (ICH). Methods to reduce haemorrhage while retaining or enhancing benefit could increase benefit for patients. Most trials tested rt-PA at 0.9mg/kg. Other doses, drugs and routes of administration might increase benefit and reduce hazard.

Methods: We searched MEDLINE, EMBASE, Cochrane Controlled Trials Register, other relevant databases, internet and journals to Oct 2011 for randomised trials of a) different doses of the same drug, b) different drugs, or c) different routes of administration, in patients with acute ischaemic stroke. We assessed trial quality, extracted data and cross checked discrepancies and calculated the odds ra-
Background: Identification of predictors of favourable outcome in stroke patients treated with thrombolysis can help to determine the prognosis and individualize treatment. The aim of our study was to find the predictors of the favourable outcome of Safe Implementation of Thrombolysis in Stroke (SITS) register.

Method: We analysed patients data entered in the registers SITS in the period between February 2003 and February 2010. Univariate and multivariate analysis was used to identify predictors of favourable outcome which was defined as modified Rankin scale 0-1 at 3 months.

Results: Overall 3053 patients were treated by intravenous thrombolysis. Altogether, 462 (15%) patients died and 1308 (43%) achieved favorable outcome. Symptomatic intracerebral haemorrhages (according to SITS definition) were observed in 62 (2%) patients. Multivariate analyses identified following characteristics significantly associated with the favourable outcome: age (increment by...
bral artery (MCA) infarction has a high mortality rate. Several randomized trials have shown that decompressive hemi-cranieectomy (DH) significantly reduces mortality, with a lesser impact on functional capacity. Questions remain regarding the optimal timing of surgery and whether there is an age limit for benefit. Our goal was to evaluate factors that might influence the functional outcome and mortality rate in a series of patients with malignant MCA infarction undergoing DH.

Methods: Retrospective review of medical records of all patients with malignant MCA infarction undergoing DH between January 2006 and June 2011. Demographic, clinical and imaging data were collected. Outcome measure included case fatality and the score on the modified Rankin scale (mRS) at 12 months.

Results: We included 22 patients with a mean age of 51±9 years. Stroke was attributed to large vessel atherosclerosis in 23% and to cardioembolism in 32% of cases. On admission, mean NIHSS and GCS scores were 18 and 12, respectively. Intravenous thrombolytic treatment was performed in 32% of patients. Surgery was performed within the first 48 hours after symptom onset in 50% of cases. The rate of postoperative complications was 55%, mainly infections. Mortality rate at 12 months was 14.3%. Independent walking (mRS≤3) was achieved in 38% of patients, and those were significantly younger (p=0.028). There was no statistically significant relationship between outcome and stroke etiology, thrombolysis, neuroimaging features (% of hypodensity in the affect-
ed hemisphere, degree of midline shift, signs of herniation), timing of surgery or the presence of surgical complications. Conclusion: Our series confirmed a significant reduction in the mortality rate with DH. Additionally, more than a third of patients regained autonomous gait, with better functional outcomes observed in younger patients. Timing of surgery did not contribute to prognosis.

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Repeated Intravenous Thrombolysis For Early Recurrent Ischemic Stroke
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Background: Intravenous thrombolysis (IVT) is efficacious in improving functional outcome, if given within 4.5 hours from stroke onset. It is usually considered one time opportunity, thus its repeated use in patients with early recurrent stroke is of unknown value.

Methods: We identified 3 patients who suffered a recurrent ischemic stroke within 3 months after the index event. All patients received IVT twice: for treatment of the index stroke (IVT-1) and the recurrent stroke (IVT-2). Demographic and baseline clinical data, neuroradiological findings, and bleeding complications were analyzed. The modified Rankin scale (mRS) was used to assess the functional outcome immediately before and 3 months after the recurrent stroke. Favorable outcome was defined as mRS 0 to 2.

Results: Median age was 73 years (range, 61 to 86 years). The median National Institutes of Health Stroke Scale (NIHSS) score on admission for the index stroke was 12 (range, 4 to 13). Functional outcome after the index stroke was favorable in all patients. The median time interval between IVT-1 and IVT-2 was 11 days (range, 8 to 33 days). Functional outcome after the index stroke was favorable in all patients. The median NIHSS on admission for the recurrent stroke was 4 (range, 2 to 12). There were no bleeding complications. At 3 months after the recurrent stroke, functional outcome was favorable in all patients.

Conclusion: Repeated IVT might be an option for selected patients with early recurrent stroke, though larger studies are needed to assess its safety and efficacy.
Intra-arterial treatment with thrombectomy devices, stenting and thrombolysis for the treatment of acute ischaemic stroke: The Irish Experience 2010-2011

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Background:
In excess of 10,000 patients present to Irish hospitals annually with acute stroke with a recent dramatic improvement in their time to presentation. This case series aims to evaluate the experience of an Irish teaching hospital following the introduction of intra-arterial treatment for acute ischemic stroke. Non-contrast CT brain and CT angiogram is carried out as standard protocol in all patients presenting within the thrombolytic window enabling consideration for additional intra-arterial treatment in patients with large proximal vessel occlusion. A case by case evaluation of patients referred by other Irish acute stroke services is also provided.

Methods:
Patients presenting from Jan 2010 to Dec 2011 were identified. All cases were initially considered for intravenous thrombolysis. Intra-procedurally the location of large vessel occlusion, thrombectomy device and passes, use of alteplase, and degree of vessel recanalisation were recorded. Clinical outcome, complications and functional status by modified Rankin scale (mRS) at 7, 30 and 90 days were recorded.

Results:
Intra-arterial intervention was carried out on 28 patients, including 15 from other services. The average age was 59 years and presentation NIHSS 15(6-27). Large vessel occlusion included 27 anterior circulation and 1 posterior. The mRS was 0 for 27 patients. Intravenous thrombolysis was given in 22 cases(78%).

The total mortality at 30 days was 7 patients(25%).

Mortality and Functional outcome(30day): Figure 1

Discussion:
Our experience to date suggests the mortality of this procedure is significant yet within internationally recognised standards. In patients where successful revascularisation is achieved, there is prospect for full functional recovery. This illustrates the potential for successful outcomes in carefully selected patients whom otherwise would have a very poor prognosis. Consideration for therapy is reliant on the provision of emergency CT angiography in acute stroke centres.

Figure 1

<table>
<thead>
<tr>
<th>Mortality</th>
<th>mRS 0/30day</th>
<th>mRS 1/30day</th>
<th>mRS 2/30day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total: 7/25%</td>
<td>Total: 11/49%</td>
<td>Total: 3/10%</td>
<td>Total: 7/25%</td>
</tr>
<tr>
<td>Revascularised Total: 22pts 78%</td>
<td>5</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>Failed to revascularise Total: 4pts 14%</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Unable to access ICA Total: 2pts 7%</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

1 less than 24 hours, 5 less than 7 days, 7 less than 30 days
Among the subjected patients, 28 patients (45.9%) showed a poor outcome (mRS 3-6) at 90 days after AIS. Compared to 33 patients with good outcome, those patients with poor outcome had longer interval from onset to puncture time ($p<0.01$), lower recanalization ($p=0.02$), and higher serum glucose level ($p=0.02$). In MRI findings, those patients with poor outcome had much larger DWI lesion size ($p=0.02$) and lower rCBV ratio on PWI ($p<0.01$) than those with good outcome after IA thrombolysis. However, there was no any significant difference of the presence of DPM on PWI in AIS patients between good and poor outcome.

In multivariate analysis for the occurrence of poor outcome after IA thrombolysis, non-recanalization ($OR=5.45$, CI=1.25 to 23.83, $p<0.01$), reduced rCBV ratio on PWI ($OR=14.30$, CI=1.48 to 59.23, $p=0.03$) and shorter interval of onset to puncture time ($OR=4.47$, CI=1.14 to 17.59, $p=0.02$) had an independent significance. Conclusion: In this study, rCBV ratio on perfusion images might be an important tool to estimate the prognosis the fate after IA thrombolysis in AIS. Further studies will be needed to verify this notion in the future.

**Residual platelet reactivity and silent embolic cerebral infarction after cervicocranial artery stenting: Diffusion-weighted imaging study**
Background Endovascular procedures for cerebral steno-occlusions are increasingly being treated as a new therapeutic option. We hypothesized that high residual platelet reactivity increases the occurrence of silent embolic cerebral infarction (SECI) after stent placement of cerebral artery. Method Patients undergoing cervicocranial stent placement were recruited prospectively and were pre-medicated with anti-platelet agents (aspirin 100mg and clopidogrel 75mg). One day before procedures, immediately and 24-hour after stenting, aspirin reaction units (ARU) and P2Y12 reaction units (PRU) were measured. ARU≥550 and PRU≥275 were defined as aspirin and clopidogrel resistance, respectively. To analyze the association between SECI and residual platelet reactivity, diffusion-weighted imaging (DWI) was performed in all patients before and after procedures. Result Seventy-five consecutive patients (age 38-83, mean 62.7) underwent stent placement for 85 steno-occlusions. SECI was observed in 44 patients (58.7%, 49 vessels). The majority of the lesions (73%) were located within the territory of stented vessels. The procedures for extracranial steno-occlusions were developed SECI more frequently as compared to those for intracranial arteries (69% vs. 47%; p=0.029). However, the incidence of SECI was not associated with the value of ARU or PRU or resistance to both anti-platelet agents. The upward trend in PRU before and after the procedure was observed only in patients with SECI (p=0.033). Conclusion Our study suggests insufficient platelet inhibition after dual anti-platelet agents is not related with SECI developing after cervicocranial stent placement, but the increase of PRU after stenting may be associated with SECI.

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Including the intercaudate distance as brain atrophy marker improves the prediction of malignant middle cerebral artery infarction by acute DWI lesion volume

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Background: The potential impact of pre-existing brain atrophy on the course of space-occupying MCA infarction and the development of MMI remains unclear. We tested the hypothesis that combination of the acute DWI lesion volume with simple measures of brain atrophy improves the early prediction of MMI.

Methods: We analyzed data from a prospective, multicenter, observational study which included patients with acute MCA main stem occlusion studied by MRI within 6 hours of symptom onset. The intercaudate distance (ICD) was assessed as linear brain atrophy marker by measuring the hemi-ICD of the intact side to account for local brain swelling. Step-wise backwards binary logistic regression analysis was used to identify significant predictors of MMI. ROC analysis was carried out to identify optimal thresholds and specificity, sensitivity, PPV and NPV were calculated. Results: Of 116 patients, 21 (18 %) developed MMI. Patients with MMI had higher NIHSS score on admission (20 vs. 17), more often combined internal carotid artery + MCA occlusion (62% vs 39%), larger DWI lesion volumes (107 vs 30 ml) and a smaller hemi-ICD (8.2 vs 9.4 mm). Binary logistic regression identified DWI lesion volume (p=0.0001) and hemi-ICD (p=0.034) as significant independent predictors of MMI. Using the ratio of DWI lesion/hemi-ICD improved model performance as compared to a model based on DWI lesion alone (-2log likelihood ratio 61.0 vs 68.3). We identified 88 ml as optimal cut-off value for DWI lesion volume and 11.75 for DWI lesion volume/hemi-ICD ratio. Using this ratio instead of DWI lesion volume improved specificity (93% vs 98%), PPV (70% vs 89%) and NPV (93% vs 98%), while sensitivity remained unchanged (76% vs 76%).

Conclusion: Incorporation of hemi-ICD as a linear marker of brain atrophy may improve the prediction of MMI by lesion volume based predictive models.

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Floating arterial thrombus in acute stroke treated with intravenous thrombolysis: seven cases with mixed outcome

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Background/Introduction: Free floating thrombus (FT) in cervical and intracra-
nial arteries is an uncommon condition in patients with acute ischemic stroke (AIS). Although intravenous thrombolysis (IVT) is the current standard of acute stroke treatment independently of arterial pathology, its effects on FT are unknown. So far, only two cases of IVT of FT have been reported, with divergent outcomes.

**Objective:** The aim of this study is to present a single center experience in the clinical and radiological course of FT patients treated with IVT.

**Methods:** We retrospectively analysed all AIS in our institution between 2001 and 2011 who underwent standard IVT within 4.5 hours and who were found to have FT on pre-IVT CT-angiography. FT was defined as a thrombus with circumferential blood flow of at least 5 mm length on cervical and intracerebral arteries. Clinical and non-contrast CT information was taken into account for the IVT decision, but not presence or absence of FT. Stroke pathophysiology, clinical variables, short term clinical outcome measured by 24 hour NIHSS, early radiological course of the FT, and 3 months favourable outcome (Rankin score ≤2) were assessed.

**Results:** Of 481 standard IVT patients 7 (1.5%) had a FT. FT localization was the carotid bifurcation in 5, carotid siphon in 1 and basilar artery in 1 patients. The cause of the FT was atherosclerotic in 3, dissection in 1, atrial fibrillation in 1, unknown in 2 patients. After IVT, 4 patients showed early NIHSS improvement of which 1 had complete recanalisation and 3 had radiological improvement of the FT; all 4 patients had a favourable outcome at 3 months. NIHSS did not change in one patient who showed no recanalisation, and who had an unfavourable 3 months outcome. The remaining 2 patients showed early clinical worsening, progression of the FT to occlusion of the artery, and unfavourable 3 months outcome.

**Conclusion:** In this small series of IVT for acute stroke patients with FT, about half of the patients recovered and some worsened. Given that clinical and angiographic course run in parallel, more effective acute recanalisation techniques should be considered in selected patients FT.
Introduction:
About 30% of acute stroke occurs in people aged over 80. Thrombolysis for acute ischaemic stroke has proved benefits, but data from randomised trials in patients aged over 80 are limited. All major trials initially restricted enrolment to patients aged up to 80. Frailty, presumed higher risk of haemorrhage & mortality are the main reasons for not to treat in this cohort.
In the absence of compelling data, effective treatments like this should not be withheld from older people.
Methods:
We collected the data of stroke patients who underwent thrombolysis from our hospital thrombolysis registry (Royal Berkshire NHS Foundation Trust, one of the largest teaching hospitals in UK) for the period of 21 months from December 2009 to September 2011.
88 patients (35 aged >80 (very elderly mean 84.8) with stroke treated with intravenous Alteplase were retrospectively analysed. (Data on 2 patients were missing for baseline NIHSS score, leaving 86 patients for analysis)
We then compared NIHSS at presentation, door to needle time, onset of symptoms to treatment time and outcome at 90 days using modified Rankin scale among patients aged <80 and >80 years who received intravenous thrombolysis.
Results:
Main outcome measures:
Haemorrhage risk (symptomatic intracerebral haemorrhage (Type2 parenchyma bleed) (1.1% > 80yrs & 2.3% <80yrs) and Functional outcomes at 90 days measured by score on modified Rankin scale. (> 80yrs mean mRS 1.71 compared to <80yrs mean mRS 1.53).
Although the mortality rate was almost twice in >80yrs (>80 yrs 22% compared to <80 yrs 9.8%), it was mainly attributed to their co morbidities than the bleed secondary to thrombolysis.
Conclusions:
From stroke thrombolysis point of view, in very elderly patients with acute ischaemic stroke the functional outcome is significantly better in those who endure thrombolysis compared with those who do not. Careful patient selection and good pre alert system to reduce the door to needle time is of paramount than the age alone. Therefore age alone should never be a barrier to potential beneficial treatment.

672 Acute stroke: current treatment
THROMBECTOMY: OUR FIRST 100 PATIENTS
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BACKGROUND: In acute thromboembolic stroke, mechanical recanalization with retrieval intracranial stents may result in immediate flow restoration and improve prognosis of patients. It has been demonstrated high percentage of recanalization, but clinical prognosis of pa-
tients is uncertain. We report safety and efficacy data on the application of the thrombectomy devices in acute-stroke patients in our Comprehensive Stroke Centre. METHODS: We performed an analysis of 100 consecutive patients with acute ischemic stroke treated with thrombectomy from April of 2010. A 93% had an anterior circulation stroke. Forty percent of patients received rtPA previously. Seven patients had an occlusion of the basilar artery, 52 middle cerebral artery occlusion (38 M1-14 M2), 20 terminal carotid artery occlusions, 21 tandem occlusions. Over 95% cases had initial TIMI/TICI 0 by angiography. Good recanalization results were assessed by follow-up angiography immediately after the procedure (TIMI II-III). We divided them in two groups, good prognosis (90 days mRankin score<4) or bad prognosis and we find out variables associated with it. RESULTS: The mean age was 66.6 years (range, 33-88 years; 55% men). The median NIHSS score at presentation was 17 (range 3-26). Recanalization: (TIMI II-III) was achieved in 83%; (TICI ≥2a-3:83%;TICI 2b-3:73%). Symptomatic haemorrhage occurred in 8%. Procedural complications occurred in 4 patients like vessel perforation, two of them without consequences. Mortality was 23%; good 90-day functional outcome (mRS≤ 2) was achieved by 46%. Good neurologic outcomes (mRankin≤3) were more frequent (61%vs15%), and mortality rates were lower (24%vs50%) with successful compared with unsuccessful recanalization. CONCLUSIONS: In our analysis of a single-CSC, efficacy and safety of thrombectomy and translation to improved patient outcome is sufficiently established. Futures trials wouldn’t have to judge device efficacy but target them in patient selection criteria.

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Safety and outcome of thrombolysis in carotid dissection

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Background: Spontaneous Cervical Artery Dissection (CAD) patients often present with acute ischaemic stroke. It is not known if alteplase can be safely used and whether it improves outcome. We aimed to determine the effect of alteplase in the functional outcome and safety in CAD in a tertiary hospitalar center, comparing with non-thrombolysed CAD and thrombolysis in non-CAD stroke patients.

Methods: In our tertiary center 10 of a total of 68 CAD patients were submitted to iv thrombolysis (rTPA-CAD). Matching age, gender and NIHSS, we selected one control group of 10 CAD stroke cases without thrombolysis (non-rTPA-CAD), and a second control group of 20 non-CAD stroke patients from our iv thrombolysis register. We analysed gender, age, vascular risk factors, NIHSS, and the presence of carotid occlusion/significant stenosis at presentation. Outcome was measured by modified Rankin Scale (mRS) at 3 months and safety de-
Background: Intravenous tissue plasminogen activator (IV-TPA) remains the only approved therapeutic agent for arterial recanalization in acute ischemic stroke (AIS). Wide variations in the rates and timing of recovery are observed in thrombolyzed patients. While all IV-TPA treated patients are routinely evaluated for neurological recovery at 24 hours, considerable improvement occurs in some cases within 2 hours of treatment. We evaluated whether early neurological improvement at 2 hours after IV-TPA bolus (ENI-2) can predict functional outcomes after AIS at 3 months.

Methods: Data for consecutive stroke patients treated with IV-TPA within 4.5 hours of symptom-onset during 2007-2010 were prospectively entered in our thrombolysed registry. Data were collected for demographic characteristics, vascular risk factors, stroke subtypes and blood pressure levels before IV-TPA bolus. National Institute of Health Stroke Scale (NIHSS) scores were obtained before IV-TPA bolus and at 2 hours. ENI-2 was defined as a reduction in NIHSS score by more than 10 points from baseline score or an absolute score of 4 points or less at 2 hours after IV-TPA bolus. Functional outcomes at 3 months were determined by modified Rankin scale (mRS). Data were analyzed by SPSS 19.0.

Results: Of the 2238 AIS patients admitted during the study period, 240 (11%) received IV-TPA within 4.5 hours of symptom-onset. Median age was 65 yrs (range 19-92), 63% males, median NIHSS score at baseline was 12 (range 1-23). Median NIHSS score at 2 hours was 4 (range 0-24). Median NIHSS score at 2 hours after IV-TPA bolus was significantly lower in patients with ENI-2 (median 4, range 0-24) compared to patients without ENI-2 (median 11, range 0-24). Functional outcomes at 3 months were better in patients with ENI-2 (median mRS 0, range 0-3) compared to patients without ENI-2 (median mRS 2, range 0-6).

Conclusions: Early neurological improvement at 2 hours after IV-TPA bolus predicts functional outcomes after AIS at 3 months. ENI-2 may be a useful predictor of long-term functional outcome.
HSS 17 points (range 3-35) and median onset-to-treatment time 149 minutes. Overall, 122 (50.8%) patients achieved favorable functional outcome (mRS 0-1) at 3-months. Factors associated with favorable outcome at 3-months on univariable analysis were younger age, female gender, presence of atrial fibrillation, baseline NIHSS, onset-to-treatment time (OTT) and ENI-2. However, multivariable analysis demonstrated NIHSS at onset (OR per 1-point increase 0.907, 95%CI 0.848-0.969) and ENI-2 (OR 4.926 95%CI 1.66-15.15) as independent predictors of favorable outcome at 3-months.

Conclusion: Early Neurological improvement at 2-hours after IV-TPA bolus is a strong predictor of the functional outcome at 3-months in acute ischemic stroke patients.

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**Thrombectomy in a case of acute stroke in a patient with atrial fibrillation treated with dabigatran.**
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Background. Stroke can occur in patients with atrial fibrillation treated by warfarin or new anticoagulants (anti-Xa : 1.7% in the rivaroxaban group and 2.2% in the warfarin group in the Rocket AF study ; 1.27% in the apixaban group and 1.6% in the warfarin group in the Aristotle study, or thrombin inhibitor : 1.11% in the dabigatran 150 mg twice daily group and 1.69% in the warfarin group, in the Rely study). In those cases, fibrinolysis with rTPA is not feasible and from now on, there is no alternative therapy. We describe a case of acute stroke in a patient with atrial fibrillation under dabigatran 150 mg twice daily, treated by thrombectomy with the Solitair FR stent.

Case report and result. A 69 year old man was admitted because of a stroke occurring one hour before admission. He took 150 mg of dabigatran twice daily and had his last dose 3 hours before stroke onset. Angio CT scan of the brain showed a proximal occlusion of the right mean cerebral artery (M1). The patient had a left hemiplegia with a left hemineglect (NIHSS = 12). A thrombectomy was performed with the Solitair FR stent 5 hours after stroke onset, with a complete recanalisation (TICI 3). The CT scan of the brain performed 24 hours after thrombectomy revealed a limited infarction in the right thalamic region with moderate haemorrhagic transformation. The patient had a clinical good outcome with a mRS = 1 and a NIHSS = 3 at one month.

Conclusion. This case report illustrates the possibility to treat successfully acute stroke due to proximal arterial occlusion by thrombectomy (with the Solitair FR stent) in patients anticoagulated by thrombin inhibitor (dabigatran). Further studies would be worth conducting to assess the efficiency and safety of this therapeutic approach.
Risk of early carotid revascularization procedures in symptomatic carotid artery stenosis: a phase IV single-center study.


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Background&Purpose: The latest AHA/ESO guidelines suggest that in appropriate candidates with symptomatic carotid artery stenosis (SCAS), carotid revascularization procedures should be performed preferentially within 2 weeks of the symptomatic event. Still only a minority of patients undergoes carotid revascularization procedures within the recommended time limit mainly because of a traditional reluctance from surgeons to operate early after a symptomatic cerebrovascular event due to a perceived higher incidence of complication events. We performed a prospective phase IV study to evaluate the safety of early carotid revascularization procedures in SCAS patients.

Subjects&Methods: Consecutive patients with symptoms of acute cerebral ischemia (ACI) due to SCAS (>70%) underwent carotid endarterctomy (CEA) or carotid artery stenting (CAS) within 2 weeks from symptom onset during the two-year study period. Complications during CEA/CAS including peri-procedural and 1-month recurrent stroke or transient ischemic attack (TIA) myocardial infarction (MI) and cranial nerve palsy (CNP) were documented. Functional independence at three months was evaluated using the modified Rankin Scale (mRS).

Results: A total of 19 patients with SCAS (mean age 68±9 years, 79% men, 84% acute ischemic stroke, 16% TIA) underwent early carotid revascularization procedures (79% CEA, 21% CAS) during the study period. The median elapsed time from symptom onset to carotid revascularization was 8 days (range 5-12). One case of periprocedural stroke was documented (5%, 95%CI: 0%-26%) following CEA due to carotid artery thrombosis that was successfully treated with emergent thrombectomy. No case of recurrent stroke/TIA, CNP or MI was noted during the 3-month follow-up. All patients achieved 3-month functional independence (mRS-score of 0-1).

Conclusions: Our findings indicate that the risk of early carotid revascularization procedures in SCAS patients is acceptable when the procedure is performed within 2 weeks from symptom onset and support current recommendations advocating emergent CEA/CAS in patients with a recent nondisabling symptomatic event and ipsilateral significant carotid stenosis.
Background: Patients with high grade intracranial stenosis have a high risk for recurrent stroke. We aim at assessing the longterm outcome and risk of recurrent stroke for patients after intracranial stenting with a balloon expandable stent.

Materials and Methods: Since August 2008 we prospectively evaluated all patients with symptomatic high grade intracranial stenosis treated with the Pharos stent. Follow-up data (mRS) was assessed 1 year after treatment by telephone interview via a standardized protocol by the same clinician.

Results: 59 patients had elective treatment. Mean stenosis grade was 78% (according to NASCET criteria). Postinterventionally only 2 patients showed residual stenosis, both less than 25%. 2 procedural complications occurred, one case of mild hemiparesis and one with hemiplegia. There was no intracranial hemorrhage. For 44 patients follow-up data could be obtained; there was one stroke in the treated vessel’s territory, one patient died because of an in-stent thrombosis after ceasing clopidogrel medication too early.

Conclusion: Elective endovascular treatment of intracranial stenosis with the Pharos stent has a low procedural risk (< 4%). The cumulative risk including FU-data was no more than 9%, being less than in the WASID study and in the SAMMPRIS trial 2011 for aggressive medical treatment alone.
Background: Acute ischemic stroke (AIS) caused by basilar artery occlusion (BAO) is often associated with a severe and persistent neurological deficit and a high mortality rate. Various treatment concepts are being used. The aim was 1) to assess the association between outcome and treatment type and 2) to identify predictors of good outcome.

Methods: The set consisted of 50 consecutive AIS patients with radiologically confirmed BAO (37 males; mean age 64.7+/-12.4 years). Stroke severity at time of treatment was assessed as severe (coma, locked-in state, tetraplegia) or mild to moderate. 30-day outcome was assessed using a modified Rankin scale (mRS) with good outcome defined as score 0-3. The following treatments were used: antithrombotics (AT); intravenous thrombolysis (IVT); IVT with subsequent intraarterial therapy (IVT+IAT); intraarterial therapy alone (IAT). Other observed factors were age, mRS score before stroke onset, time to treatment, recanalization rate.

Results: AT was used in 8, IVT in 12, IVT+IAT in 13, IAT in 17 patients. Good outcome was found in 0 AT, 2 (16.7%) IVT, 7 (53.8%) IVT+IAT, 3 (17.6%) IAT patients (p>0.05). The following statistically significant differences were found between patients with good vs. poor outcome: mean age 54.2 vs. 68.0 years (p=0.0004); recanalization rate 91.7 vs. 47.4% (p=0.008); presence of severe neurological deficit 25.0 vs. 65.8% (p=0.02). Logistic regression analysis identified age (OR=0.875; p=0.004), presence of severe neurological deficit (OR=0.875; p=0.004), time to treatment (OR=0.602; p=0.035) as significant independent predictors of good outcome.

Conclusion: In the presented study, an apparent (although statistically insignificant) trend for better outcome was observed in the IVT+IAT group. Age,
severe neurological deficit, time to treatment were identified as significant independent predictors of good outcome. Supported by the grants NT/11386-5/2010, NT/11046-6/2010 (IGA MH CR), CZ.1.05/2.1.00/01.0030.

Methods
CT Brain scans of 196 patients who had an ischaemic stroke between 1/3/2010 and 31/5/2011 in our trust were reviewed by 2 specialists to look for the DMCAS.
Records were then reviewed to establish:
• If the patient was thrombolysed
• Modified Rankin Score (MRS) on discharge
• Patient age
• Length of hospital stay
• Mortality
The thrombolysed group was compared with the non-thrombolysed.

Results
41 (20.9%) patients had the DMCAS. Of these, 10 were thrombolysed (24.4%). 7 (70%) of the thrombolysed had an MRS of less than 2, compared to 2 (6%) of the non-thrombolysed, (p=0.0002). 6 (60%) of the thrombolysed had a length of stay of less than 21 days compared to 21 (32 %) of the non-thrombolysed, (p=0.1496). 90 day mortality in the thrombolysed was 0 and 8 in the non thrombolysed, (p=0.008). There was no significant difference in age. (median = 76 years in non thrombolysed, 66 in thrombolysed, p=0.18).

Reasons for non thrombolysis included:
Admission ‘outside of hours’ (n= 14), presentation after more than 3 hours / unclear time of symptom onset (n= 12), not fulfilling the thrombolysis criteria for other reasons (n=5).

Conclusion
The study suggests that thrombolysis is significantly beneficial for patients with severe ischaemic stroke.
Recurrence of ischemic stroke in patients submitted to intravenous thrombolysis
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Background:
Neurological deterioration after acute ischemic stroke is associated with worst outcome. Mechanisms of deterioration include brain edema after a large infarction, hemorrhagic transformation, recurrent stroke and systemic causes. In patients submitted to thrombolysis an early neurological deterioration normally raises the suspicion of symptomatic intracerebral hemorrhage. Recurrent ischemic stroke, defined as an ischemic stroke involving arterial territory previously not affected, is another cause. Cases of systemic embolization after administering rtPA have been described. Recent studies show an association between recurrent ischemic stroke and atrial fibrillation. We present the patients submitted to thrombolysis in our center that had recurrence of ischemic stroke in the first 30 days.

Case reports:
Of the 264 patients undergoing thrombolysis in our hospital, 4 (aged 69-90 years), showed neurological deterioration by recurrent ischemic stroke in the first 30 days. At admission they had total anterior circulation syndromes (OCSP classification), NIHSS 15-22. Atrial fibrillation was detected in 1 patient. Symptoms-thrombolysis time was 80-120’. In 2 of them (1 with AF) deterioration occurred early after thrombolysis (65’ and 100’), in the others occurred at the 3 and 19 day of hospitalization. In 1 patient aspirin had been suspended by GI hemorrhage. Repeat cerebral CTs revealed bilateral infarcts, with a new contralateral infarct. Cervical Doppler was performed in 3 patients: 1 showed bilateral ICA occlusion. Three of the patients died, between 1-4 days after the recurrence of the ischemic event.

Discussion:
The reported overall risk of stroke recurrence after an ischemic stroke is 4% at 30 days. At our center, the recurrence was observed in 1.5% of the patients undergoing thrombolysis; 50% occurred very early after the perfusion, which may indicate that in these cases rtPA might have had a causal role, presumably by disintegration of pre-existing thrombus.

Perfusion computed tomography guided intravenous thrombolysis in ischemic stroke >4.5 hours: witnessed vs. unknown onset time
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Unclear onset patients, we hypothesized that both the proportion of patients amenable for thrombolysis and their response to i.v. thrombolysis may differ among the groups of late patients with witnessed vs. unknown onset time.

Methods. We prospectively studied consecutive acute middle cerebral artery (MCA) non-lacunar ischemic stroke patients presenting >4.5 hours from LSN. All patients underwent multimodal CT and were considered eligible for i.v. thrombolysis if: (1) ASPECTS ≥7 on plain CT, (2) infarct core<1/3 of hypoperfused tissue, (3) MTT/CBV mismatch>20%. Two patient groups were established attending whether stroke onset was witnessed or not. Both groups were compared regarding the proportion of candidates amenable for thrombolysis and their outcome after i.v. thrombolysis. Results. Among 121 MCA ischemic stroke patients presenting >4.5 h from LSN, stroke onset was witnessed in 64 and unknown in 57. Thirty-two (50%) patients in the first group and 25 (44%) in the second met PCT criteria for thrombolysis. Baseline variables were comparable between both groups with the exception of age, which was greater in the unclear onset group. The rates of early neurological improvement (50% vs. 48%), 2-hour MCA recanalization (45% vs. 27%), symptomatic hemorrhagic transformation (3% vs. 0%) and good 3-month functional outcome (62.5% vs. 52%) did not differ significantly between both groups. Conclusion. Against to our hypothesis, the two groups of delayed stroke patients (witnessed vs. Unclear onset) were comparable in eligibility and in the response to PCT-guided i.v. thrombolysis.

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Thrombolysis for ischemic stroke: beyond the 3 hours

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Background: Intravenous thrombolysis is the most effective therapy for acute ischemic stroke, but there are several legal restrictions for its use. An onset-to-treatment time < 3 hours is an important exclusion factor for many patients. Our goal was to analyse the functional outcome and safety profile of alteplase in the group treated within 3-4.5 hours in a tertiary hospital.

Methods: We conducted a retrospective analysis of all i.v. thrombolysis carried out between July 2006 and June 2011 in a tertiary hospital where the ethical committee approved treatment from 3-4.5h. We analysed gender, age, previous vascular risk factors, systolic and diastolic blood pressure (BP), glucose and NIHSS at presentation, onset-to-treatment time and aetiology (TOAST). The functional outcome was assessed by modified Rankin scale (mRS) at 3 months and the safety profile was analysed by the occur-
Introduction: Prognosis of basilar occlusion is devastating, with high mortality rates and poor functional outcomes. Nevertheless, there are gaps in the knowledge about the best management of basilar occlusion not submitted to acute revascularization therapy. We present two cases that exemplify the difficulty to apply current guidelines to basilar occlusion.

Clinical case: Patient 1: 51-year-old man, with hypertension, diabetes and dyslipidemia, presented to the hospital with vertigo, imbalance, dysphagia and diplopia. MRI angiography disclosed absent flow in both distal vertebral arteries and in the basilar trunk. Patient 2: 57-year-old man, history of hypertension and diabetes; presented to the hospital with dizziness, imbalance, diplopia and hemiparesis. MRI angiography showed signs of right vertebral and proximal basilar artery occlusion. Both patients remained on absolute rest and under anticoagulation. In patient 2 there was worsening when change to aspirin was tried during admission. Patients were very sensitive to blood pressure variation, and high values of BP were necessary to allow a very gradual orthostatic position without symptoms worsening. BP was progressively lowered to normal values during the next months, and one year later they changed from warfarin to aspirin. Almost 2 years after the clinical events, patient 1 has a slight ataxia and patient 2 a very discrete hemiparesis, being autonomous for daily activities.

Discussion: According to the literature, patients with intracranial occlusive...
disease should be treated with aspirin instead of warfarin (Wasid study), and should have normal BP after the acute phase for secondary prevention (ESO recommendations, SAMMPRIS study). Although these rules should be followed in the majority of stroke patients, in critical cases of occlusive disease patients might need anticoagulation and a permissive higher BP to optimize cerebral perfusion while collateralization and neovascularization is being developed.

685 Acute stroke: current treatment

STAR Trial: SOLITAIRE FR THROMBECTOMY FOR ACUTE REVASCULARISATION: Interim analysis

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Single arm, prospective, multi-center, observational study with consecutive inclusion. The aim of the study is to evaluate mechanical thrombectomy with the Solitaire FR as first line device and used according to hospitals’ stroke protocols. The target number of patients is 200. There are 20 international centers participating. Patients main inclusion criteria are: acute ischemic stroke in anterior circulation, aged 18-85 years. Baseline NIH stroke scale between 8 and 30 and pre-stroke mRS ≤2 with treatment initiated within 8 hours of symptom onset. Primary endpoint is recanalization of the occluded vessel, core lab reviewed, using TICI score with TICI 2b and 3 defined as successful recanalization. The secondary endpoints are: time to revascularization, NIHSS at 90 days, mRS at 90 days, incidence of symptomatic intracranial hemorrhage and immediate flow reperfusion. All adverse events will be reviewed by an independent clinical committee. The data is being monitored and the controlled and reviewed data will be presented at the meeting. We present the interim results of 74 patients from 120 already included. Mean age is 66.47 years old with 34% of male patients. The median baseline NIHSS was 16.50 (8-26). The most common location has been MCA with 92% (M1 segment with 79% and M2 with 22%). The complete recanalization rate following the instruction for use of Solitaire FR (3 passes per vessel) is 80%. The immediate reperfusion was observed in 79% of the patients. Good clinical outcome (mRS≤2) was 55% (data over 29 patients with 3 months follow-up performed). The mortality was 10%. The interim results of this prospective study indicate that the
solitaire device is safe and improve clinical outcome on patients presenting stroke of the anterior circulation.

686 Acute stroke: current treatment

Intravenous thrombolysis in stroke patients older than 70 years - A Serbian Experience with Thrombolysis in Ischemic Stroke (SETIS) register
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Background – The purpose of our study was to determine the efficacy and safety of systemic thrombolysis among patients with acute ischemic stroke (IS) older than 70 years comparing to stroke patients of 70 years of age or younger.

Methods - Data were from the Serbian Experience with Intravenous Thrombolysis in Ischemic Stroke (SETIS) register of all patients who have received alteplase for acute IS in Serbia during six years period. We analyzed differences in the baseline characteristics, functional outcome measured by modified Rankin score, death and treatment complications between two groups of stroke patients – older than 70 years and aged 70 years or younger.

Results - Among 650 patients with IS who received intravenous thrombolysis, there were 155 (23.8%) patients with stroke older than 70 years. Among patients older than 70 years there were significantly less rate of favorable functional outcome (mRS 0-2) (46.4% < 70 y vs. 31.2% > 70 y; OR 1.92 [95%CI 1.30-2.82]; p<0.001) and higher rate of death (11.7% < 70 y vs. 26.7% > 70 y; OR 2.74 [95%CI 1.72-4.38]; p<0.001) at 3 months. However, there was no statistical difference in the rate of symptomatic intracerebral hemorrhage (SITS definition) among two groups of patients (2.6% < 70 y vs. 3.9% > 70 y; OR 1.49 [95%CI 0.55-3.99]; p=0.586).

Conclusion – Stroke patients older than 70 years treated with intravenous thrombolysis has higher death rate and less chance to achieve favorable functional outcome comparing to those younger than 70 years.

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Stroke etiology determines endovascular recanalization technique.
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Background: Endovascular treatment for acute ischemic stroke is increasingly available. Several technical strategies are possible to achieve the treatment and they are conditioned by heterogeneous stroke etiology

Methods: We analysed the data from a prospective register of patients with acute stroke treated with endovascular
procedure in our centre between 2009-2011. Patients were classified by stroke etiology accordingly to TOAST criteria: atherothrombotic (A), cardioembolic (C), other etiology (O) and unknown (U). Results: 69 patients were included (11 A, 36 C, 7 O, 15 U). Median basal NIHSS was 20.6 (A), 17 (C), 17.8 (O), 18.8 (U). Recanalization techniques (retrievable stent, carotid autoexpandable stent, angioplasty, intracranial stent, among others) were different in each group (retrievable stent in 80% of cases of cardioembolic stroke; stenting (carotid or intracranial) in 83% of cases of atherothrombotic group) (p<0.0001). Mean number of passes of stentriever was 1.6 (p=0.398). Complete recanalization (TICI 2b/3a) was achieved in 54.5% (A), 77.8% (C), 71.4% (O) and 73.3% (U) (p=0.515). Symptomatic haemorrhagic transformation occurred in 3 cases (2 cases in A group and 1 case in C group, p=0.1). Favourable clinical outcomes (mRS 0-2) were achieved in 18.2% (A), 57.1% (C), 42.9% (O) and 66.7% (U) (p=0.074). Mortality was 54.5% (A), 5.6% (C), 14.3% (O) and 20% (U) (p=0.003).

Conclusion:
Stroke etiology determines the endovascular recanalization technique. retrievable stent allow a high recanalization and reperfusion rates especially in cardioembolic stroke.

688 Acute stroke: current treatment

Reasons for not thrombolysing
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BACKGROUND: The development of 8 hyperacute stroke units (HASU) in London has improved care for all stroke patients and increased thrombolysis rates across the metropolis. Pan-London data from the cardiac and stroke networks reported a thrombolysis rate at Imperial in the 1st quarter of 2011 of 7%; the lowest of all the HASUs in London during that time. AIM: To scrutinise our thrombolysis decision making at Imperial, to see if patients who might benefit from this treatment were being excluded inappropriately. METHOD: 53 sets of case notes were reviewed retrospectively. Inclusion criteria for eligibility of thrombolysis included time from symptom onset < 4.5hrs and clinical diagnosis of stroke. Accepted exclusion criteria included BM>20, GCS<8, NIHSS > 25, rapidly resolving symptoms, coagulopathy, evidence for seizure as first event, pregnancy, premorbid dependency, large acute infarct or intracranial haemorrhage, uncontrolled hypertension, and unknown time of onset. RESULTS: Of the 53 patients, 44 (83%) were appropriately managed in the hyper-acute setting. 2 patients presenting with a low NIHSS and 3 patients with rapidly resolving symptoms had a significant residual deficit and may have benefited from thrombolysis. 4 patients with unknown time of onset may have been treatable with the help of multimodal hyperacute imaging. RECOMMENDATIONS: Thresholds
for treating patients with a low NIHSS or rapidly resolving symptoms are being adjusted at Imperial. The stroke and radiology teams are developing protocols for investigating patients with unknown time of onset. Prospective audit following implementation of these changes will ensure high standards of thrombolysis decision making are met and maintained. Further, we suggest a pan-London review of the methods of calculating thrombolysis rates, to include outcome data, which will ensure a consistency of approach and aid meaningful comparisons between HASUs.

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Timing of recanalization after intravenous thrombolysis determines the functional outcomes in acute ischemic stroke
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Background: Although, recanalization of acutely occluded intracranial artery remains the major aim of intravenous tissue plasminogen activator (IV-TPA) in acute ischemic stroke (AIS), its timing and impact on functional outcomes remains unclear. We evaluated this relationship in our Asian AIS cohort.

Methods: Data for consecutive AIS patients treated with IV-TPA within 4.5 hours of symptom-onset during 2007-2010 were prospectively entered in our thrombolysis registry. Data collected were demographic characteristics, risk factors, stroke subtypes. Blood pressure and NIH Stroke Scale (NIHSS) scores were noted before IV-TPA, at 2 hours and at 24 hours. Continuously monitoring with transcranial Doppler (TCD) was performed for first 2 hours for early recanalization (ER). Arterial patency was assessed on day 2 in patients who underwent CT angiography or magnetic resonance angiography, labeled as delayed recanalization (DR). Absence of recanalization on early TCD or imaging on day 2 was called persistent arterial occlusion (PAO). Favorable functional outcomes at 3 months were determined by modified Rankin scale (mRS) of 0-1.

Results: Of the 2238 AIS patients admitted during the study period, 240 (11%) received IV-TPA; median age 65yrs (range 19-92), 63% males, median NIHSS 17 points (range 3-35) and median onset-to-treatment time (OTT) 149 minutes. Overall, 122 (50.8%) patients achieved favorable functional outcome at 3 months. ER, DR and PAO were evaluated in 160 patients- ER 55 (34.4%), DR 44 (27.5%) and PAO in 61 (38.1%). Timing of recanalization was associated with favorable outcome (ER 72.7%, DR 63.6% and PAO 31.1%; p<0.005). Factors associated with favorable outcome at 3 months on univariable analysis were younger age, female gender, atrial fibrillation, baseline NIHSS, OTT and timing of recanalization. Multivariable analysis showed NIHSS at onset (OR per 1-point increase 0.907, 95% CI 0.848-0.969), ER (OR 3.32, 95% CI 1.295-9.474) and DR (OR 3.021 95% CI 1.197-7.634) as independent predictors of favorable outcome.
Predictors of hemorrhagic transformation volume after intravenous thrombolysis

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Backgrounds: Intravenous thrombolysis with alteplase is the most effective therapy for acute ischemic stroke, but hemorrhagic transformation (HT) is a potentially dangerous complication of thrombolysis. The morphology of hematoma and the presence of early neurological deterioration have been known to be related with clinical outcome, and total volume of hemorrhage is supposed to be important. However, there was lack of research to find predictors of large HT volume after thrombolysis.

Methods: From 2003 to 2009, we enrolled acute ischemic stroke patients who received intravenous alteplase based on the prospective registry of our hospital. From CT scan or MRI with gradient echo sequences 12-48 hours after thrombolysis, we calculated hematoma volume by Medical Image Processing, Analysis, and Visualization (MIPAV) software in patients with HT. We divided our subjects into four groups by stratified hematoma volume (0, 0 to 10, 10 to 25, and 25 plus mL) and analyzed the association with clinical and imaging predictors of HT. In addition, we examined the relationship between hematoma volume and clinical outcomes.

Results: Among 151 consecutive patients, 35 patients were confirmed HT on follow-up brain images. In linear by linear association test, all prognostic outcomes including symptomatic intracranial hemorrhage (ECASS, NINDS, and SITS-MOST definition), 24 hour NIHSS score, 3 month excellent (mRS 0-1) and good (mRS 0-2) outcomes, and 3 month mortality were related with hematoma volume (p<0.05). Only atrial fibrillation [OR: 4.152 (95% CI: 1.832-9.412), p=0.001] and the Hemorrhage after Thrombolysis (HAT) score of >1 [OR: 3.101 (95% CI; 1.384-6.951), p=0.006] were independent predictors for large HT volume in ordinal logistic regression analysis.

Conclusions: Hematoma volume is related with short and long-term clinical outcomes. Atrial fibrillation and HAT score of >1 are independent predictors of large HT volume.
Background:
Acute ischemic stroke (AIS) due to occlusion of the internal carotid artery (ICA) has a poor natural history. Early recanalization of occluded brain arteries in AIS is associated with better clinical outcome. Our aim is to describe two patients with AIS due to ICA occlusion who had been treated with mechanical thrombectomy with SolitaireTM AB stent.

Methods:
Description of two clinical cases:
Patient 1: A 58 years old patient was brought to our stroke unit after acute left hemiparesis, disartria and dizziness. A multiparametric cranial CT demonstrated a mismatch in the right hemisphere and a proximal occlusion of the ICA starting i.v. thrombolysis within 3 hours.
Patient 2: A 68 years-old patient reached the hospital after woke up with right hemiparesis and aphasia. The multi-modal cranial CT showed a significant mismatch in the territory of the middle cerebral artery and an occlusion of the left ICA receiving i.v. thrombolysis. In both cases after thrombolysis persisted ICA occlusion demonstrated by transcranial color-coded duplex sonography.

Results:
Angiographic study showed ICA occlusion in both cases. Thrombectomy revascularization defined as a final grade of 3 according to the thrombolysis in cerebral infarction (TICI) score was successful. Both patients were asymptomatic (NIHSS 0) after recanalization. At 3 months, the modified Rankin scale was 0 in both cases.

Conclusion:
Thrombectomy with SolitaireTM AB stent achieve immediate recanalization and good clinical outcome. Endovascular therapy with these techniques may be considered as an efficient tool for the treatment of AIS due to ICA occlusion.
for quality improvements along the acute stroke pathway, starting from estimates on their effect on rate and timing of treatment with tissue plasminogen activator (tPA).

Methods A microsimulation model was developed to describe events and outcomes at the patient level, and applied to a prospectively collected stroke patient cohort. Four potential targets for quality improvement were identified: type of first contact (911 or general practitioner), mode intake and transportation of patients by ambulance personnel (scoop and run), moving CT scan to emergency room, and accelerating laboratory testing in the hospital using point-of-care devices. The primary outcome measure was the proportion of patients treated with tPA. Secondary outcome measure was the percentage of patients treated between 0-90, 91-180, and 181-270 minutes from the onset of stroke. We compared model-predicted with the actual proportion of patients treated with tPA. Results Model outcomes suggest a 5% increase (22% to 27%) in the proportion of patients treated with tPA, relative to the current situation. Likewise, the proportion of patients treated within 0-90 and 91-180 minutes increased from 7% to 10% and 47% to 60% respectively. The proportion of patients treated within 181-270 minutes decreased from 47% to 30%.

Conclusion Quality improvements in the acute stroke pathway could be identified using simulation modelling leading with estimates of increases in the proportion of patients treated with tPA, and acceleration of time between the onset of stroke and treatment. Simulation modelling can be a useful and efficient tool to improve implementation of critical barriers in the acute stroke pathway and thereby improve tPA treatment on rate and timing.

Outcomes in thrombolysis patients treated with labetalol

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Background: Brain hemorrhage is one of the most feared complications in ischemic stroke patients submitted to thrombolysis, with elevated blood pressure (BP) as the main risk factor. When above 180/110 mmHg, before or during rtPA perfusion, intravenous treatment (eg. labetalol) is the proposed intervention. We intended to know if the outcome differed between labetalol treated and not treated patients.

Methods: From our registry of consecutively thrombolysed patients (February 2007 – September 2011) we identified the ones treated with labetalol. Demographics and risk factors were noted, as were hemorrhagic complications, NIHSS (admission, 24 hours, discharge) and modified Rankin scale (mRS) at discharge and 3 months follow-up.

Results: From the 265 patients only 12 need labetalol (4.5%). Seven were women (p=0.368); aged 70±5, 7 (p=0.606); 3
diabetics (p=0.715); 10 had history of high BP (p=0.079); 5 heart problems (p=0.388); mean glicemia (admission) 140 mg/L (p=0.456). Mean NIHSS: on admission 13 (p=0.515), 10 at 24H (p=0.771), 8 at discharge (p=0.561). Five had hemorrhagic complications (p=0.248). MRS at discharge (p=0.339) and at 3 months (p=0.622) was not different between groups.

Conclusion
Blood pressure reduction with intravenous labetalol before/during rtPA perfusion was not associated with worst outcome in our patients.

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Interaction of aetiology, gender and age on thrombolysis success for ischemic stroke
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Background: Alteplase is the most effective treatment for acute ischemic stroke. Knowing its interaction with non-modifiable risk factors may help in selecting patients for treatment. Our aim was to determine the outcome and safety profile of intravenous thrombolysis for ischemic stroke regarding age, gender and aetiology.

Methods: All intravenous thrombolysis in acute stroke, in a five-year period in a tertiary centre, were analysed by gender, age, aetiology of stroke (TOAST), NIHSS, systolic and diastolic blood pressure and glycaemia at presentation, and onset-to-treatment time. Outcome was assessed by modified Rankin scale (MRS) at 3 months and safety determined by significant intracranial haemorrhage (SITS definition).

Results: There were 451 thrombolysis with median age of 71 (60-78) yrs and NIHSS 13 (8-18). Ethiology was cardio-embolic in 35%, atherosclerotic in 18%, small vessel disease (SVD) in 8%, and undetermined in 37%. SVD was associated with higher independence (MRS 0-2) [70 vs. 35%; OR=2.8 (IC95% CI 1.3-6.3); p=0.012] and lower mortality [0 vs. 16%, p=0.013], which were explained by younger age (p=0.002) and lower NIHSS (p<0.00001) compared to other aetiologies. Increasing age associated with lower chance of independence [OR = 0.6 (0.5-0.7), p <0.00001] and complete recovery (mRS0-1) [OR = 0.7 (0.5-0.8), p<0.00001] and higher mortality [OR=2.5 (1.8-3.5), p<0.00001]. Older age appears to increase the risk of significant bleeding [OR =1.8 (1.0-3.3), p=0.034], but there was no difference between the groups aged over or within 80 years (p=0.268). Gender did not influence outcome or haemorrhage.

Conclusion. The main prognostic factors were age and NIHSS at presentation. The aetiology showed similar relationship with functional outcome, after adjustment for these confounding variables. Our data suggest that it might be not justifiable to exclude for thrombolysis cases of suspected small vessel disease, as it is standard practice in some centres.
The influence of bolus infusion delays on plasma Tissue Plasminogen Activator levels


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Background and purpose:
Estimates of the rates of neuronal loss in acute ischemic stroke show that the typical patient may lose 1.9 million neurons each minute that treatment is delayed. Consequently, significant emphasis has been placed on early evaluation and thrombolysis in acute stroke. Tissue plasminogen activator (TPA), the only approved thrombolytic therapy for acute stroke is administered as a bolus followed by an immediate infusion because of its short half life. However, in the real life clinical situation delays in starting the infusion after the bolus and interruptions in the infusion may occur. We sought to simulate the effect on serum TPA concentrations, of different intervals of bolus-infusion delays or interruptions in the infusion.

Methods:
We simulated the affect of multiple intervals of delay after the bolus on serum TPA concentrations using known pharmacokinetic parameters of TPA. We also simulated the effect of rebolusing with TPA if significant bolus infusion delays occur. The effect of different interval interruptions in the infusion was also explored.

Results:
We show that delays in starting the infusion may have significant effects on serum TPA concentrations. Similarly, interruptions in the infusion can also significantly influence TPA levels. We also show that in the instances where there has been a significant interval delay in the infusion or there has been a significant interruption in the infusion, rebolusing with TPA rapidly restores TPA levels to the target levels.

Conclusion:
Bolus infusion delays or interruptions in the infusion of TPA after the bolus may significantly impact on serum TPA levels. Protocols or administration regimens should be employed to prevent delays or interruptions in the infusion. When delays do occur, re-bolusing of TPA may be needed.
Acute stroke: current treatment

Thrombolysis in patients above 80 years: is it worth?

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Background: Intravenous thrombolysis is the most effective therapy for acute ischemic stroke. Legal restrictions for its use include the age limit of 80 years. Our aim was to analyze the functional outcome and safety profile of alteplase in patients older than 80.

Methods: We analyzed iv thrombolysis in stroke in a five-year period in a tertiary centre. Variables studied were gender, age, previous vascular risk factors, systolic and diastolic blood pressure (BP), glucose and NIHSS at presentation, onset-to-treatment time and aetiology (TOAST). The functional outcome was assessed by modified Rankin scale (mRS) at 3 months and the safety profile was analysed by the occurrence of significant intracranial haemorrhage (SITS definition).

Results: We included 451 thrombolysed cases, and compared the group aged less or equal to 80 years (n=387, 86%) with older patients (n=64, 14%). At presentation, the latter showed a greater deficit [NIHSS: 17 (12-21) vs. 12 (8-18), p = 0.0001], and percentage of cardioembolic aetiology (52% vs. 33%, p=0.005). The groups did not differ regarding onset-to-treatment time (p=0.905). The older group had a lower probability of excellent recovery (mRS 0-1) [13 vs. 33%,
**Methods**

In the event of death, patients from the Stem cell Trial of recovery EnhanceMent after Stroke 2 (STEMS-2), a randomised controlled trial assessing the safety of G-CSF administration 3-30 day post stroke, were eligible to take part in a post mortem substudy. Lesion morphology from histological samples was described qualitatively by a consultant neuropathologist blinded to treatment. Immunohistochemical characterisation for astrocytes (GFAP), microglia (CD68) and cell proliferation (Mib-1) was performed in addition to CD34, G-CSF protein and G-CSFR. ‘Non-trial’ stroke brains were used as control cases.

**Results**

The brains of 3 patients treated with G-CSF were compared to 3 control brains (mean age 76 and 64 respectively) analysing areas of acute, subacute and chronic infarction. There was no discernable difference in immunoreactivity between groups [6 vs. 3%, OR=2.1 (0.7 to 6.7), p=0.261; adjusted OR=1.5 (0.4 to 5.2), p=0.531].

**Conclusions**

The use of alteplase in older patients was associated with worse functional outcomes, which can be expected from the natural history of the disease in the aged. However, this treatment appears to be equally safe, and it has allowed 14% more patients to benefit from this therapy.
Comparison of different endovascular procedures in combined thrombolysis for acute ischemic stroke due to proximal occlusions in the anterior circulation

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Background and purpose: To compare different endovascular procedures in patients undergoing combined thrombolysis for acute ischemic stroke.

Patients and methods: Consecutive ischemic strokes admitted within a 4h30 hour window were prospectively collected. A combined approach was used with intravenous therapy (alteplase 0.6mg/kg) during 30 minutes, and, in absence of recanalisation assessed by transcranial color-coded ultrasound, intra-arterial and/or mechanical therapy. Three different endovascular procedures were used: intra-arterial alteplase, penumbra device or solitaire stent. Study endpoints were recanalisation rate (TMI 2-3) and its timing according to the endovascular procedures, outcome at 3 months (mRS 0-1), symptomatic haemorrhagic complications and mortality.

Results: 76 patients were included with intra-arterial thrombolysis (IA) in 30, penumbra device (PD) in 24 and stent “solitaire” (stent) in 22. NIHSS at baseline was similar in the 3 groups. Recanalisation was achieved in 95% in the stent, in 92% in the PD (92%) and in 60% in the IA group. Time to recanalisation was significantly shorter in the stent group (mean value of 292 min versus 359 min in the PD and 346 min in the IA group, p<0.02). At 3 months a favourable outcome could be noticed in 59% in the stent, in 25% in the PD and in 43% in the IA group. Symptomatic haemorrhages complications and mortality at 3 months were observed in respectively 6% and 13% in the IA, 4% and 0% in the PD and 9% and 4.5% in the stent group.

Conclusion: Combined thrombolysis using stent as the endovascular approach allows significantly shorter delays to recanalisation as compared to the other two procedures. Also, when stent treatment is used, a higher proportion of patients will reach a favorable outcome at 3 months. No difference was further observed regarding symptomatic intracranial haemorrhage nor mortality.

Acute stroke: new treatment concepts

Lowering Blood Pressure Therapy
For Acute Vertebral Artery Dissection with Isolated Headache

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Purpose: We evaluated the effect of lowering blood pressure therapy for acute vertebral dissection with isolated headache.

Method: We reviewed medical record of 18 consecutive patients (median 46 years old) who admitted our hospital from June 2004 to November 2011 because of acute vertebral artery dissection with isolated headache. They did not have any brain infarction or hemorrhage. We investigated risk factors such as hypertension, involved artery, acute management of blood pressure and outcome at 3 months.

Results: All of the 18 patients had occipital or posterior cervical pain. History of hypertension was seen in 5 patients (28%), and smoking habit was in 6 patients (33%) but other risk factors were rarely complicated. We diagnosed acute vertebral artery dissection by angiographic or MR findings of intimal flap, pearl and string sign, or string sign. The string sign needed signal of intramural hemorrhage on fat-suppressed T1-weighted image MRI. Dilatation of
vertebral artery was complicated in 12 patients (67%). Eleven patients whose systolic blood pressure was 140 mmHg or higher and four patients with normal blood pressure were treated by antihypertensive agents for target systolic blood pressure of 110 - 130 mmHg. In the other three patients with normal blood pressure, antihypertensive medicine was not administered. Headache improved in a few days and mostly relieved by 2 weeks. During the follow up period of 3 months, no hemorrhagic or ischemic events occurred. Involved vascular lesions improved in all the 15 patients who had antihypertensive treatment, but in the three patients who did not have, the vascular lesion improved in two and deteriorated in the other one.

Conclusion: In acute stage of vertebral arterial dissection with isolated headache, it seems that antihypertensive treatment is effective not only for patients with hypertension but also for those with normal blood pressure.

700 Acute stroke: new treatment concepts

Haematopoietic stem cell (CD34+) uptake of superparamagnetic iron oxide (SPIO) is enhanced by but not dependent upon, a transfection agent. Implications for cellular therapy in stroke.

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Background
Superparamagnetic iron oxide particles (SPIO) can be internalised into stem/progenitor cells to allow real-time tracking with gradient echo magnetic resonance (MR) imaging. It is unclear whether haematopoietic stem cells (HSC) are able to take up SPIO in the absence of a transfection agent to enhance the process.

Methods
Human bone marrow-derived HSC (CD34+ve) were incubated in vitro with (i) medium only (control), (ii) a SPIO (ferumoxide, Endorem, which is licensed for human use) and (iii) ferumoxide plus protamine sulphate - as a transfection agent. Cells were incubated for 2, 4 and 24 hours and assessed for viability, differentiation capacity (in a haematopoietic cell culture system) and visualised in vitro with 3T magnetic resonance imaging. During each phase of this study, the cells were analysed using flow cytometry and morphology examined by electron microscopy.

Results
Bone marrow-derived CD34+ve HSCs were able to internalise ferumoxide in vitro independently of a transfection agent. However, uptake of ferumoxide was enhanced following incubation with protamine sulphate. Iron labelling of CD34+ve cells in this manner did not affect cell viability, did alter cell characteristics as analysed by flow cytometry (as compared to controls), and did not appear to affect the potential of the cells to grow and to differentiate in a haematopoietic culture system. The iron-labelled CD34+ve cells could be visualised in vitro on 3T MRI scanning.

Conclusions
These data suggest that CD34+ve HSC labelled with SPIO in this way could be used to track cell fate after infusion into patients with stroke and thus to calculate the cell dose required for effective cell therapy.

**701 Acute stroke: new treatment concepts**

**Utility of DWI/PWI-combined factor to predict short-term clinical outcome in stroke patients within 4.5 hours of onset due to the carotid artery occlusion**

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**Purpose**

It is not clear how to use DWI/PWI results. The aim of our retrospective study was to investigate the DWI/PWI-combined factor to predict short-term clinical outcome in stroke patients admitted within 4.5 hours from sudden onset due to acute carotid artery occlusion.

**Subjects and Methods**

Included for analysis were stroke patients 1) who were admitted within 4.5 hours of onset between Jan 2006 and January 2011, 2) who presented NIHSS score of 6 or more on admission, and 3) who underwent emergency MR imaging, which suggested the affected carotid artery occlusion. We assessed, NIHSS on admission (NIHSS adm), DWI-ASPECT score, PWI-Time-Intensity Curve (TIC) grade (1 to 4), successful recanalization, NIHSS on the 7th day, and in-hospital death. TICs were generated on region of interests set at symmetrical positions of the bilateral MCA territories, and classified into four grades according to the time to peak (TP) and the reduction value of the peak signal (PS). DWI-ASPECT score of 5 or more and TIC grade of 2 or more was assessed as a DWI/PWI-based combined factor (A5T2).

**Result**

Eighty-seven patients were included for analysis. NIHSS adm (median) was 20, DWI-ASPECT score (median) was 6, there were 36 in TIC grade 1, 39 in grade 2, 12 in grade 3, and 0 in grade 4, 39 patients (44.8%: 39/87) underwent reperfusion therapy and successful recanalization was achieved in 18 patients (46.2%), 7-day NIHSS (median) was 20, and 29 patients died. Among the 46 patients with A5T2, twenty-eight patients (60.9%) underwent reperfusion therapy and thirty-one patients (67.4%) obtained 7-day NIHSS improvement. Logistic regression analysis indicated that successful recanalization (p<0.05) and A5T2 (p<0.05) were independent predictors for 7-day NIHSS improvement and A5T2 (p<0.001) was an independent predictor for in-hospital survival.

**Conclusion**

The combined factor (A5T2) based on DWI/PWI is an independent predictor for 7-day NIHSS improvement and in-hospital survival.
confirmed occlusion of the basilar artery (BA), the main branch of the middle cerebral artery (M1) or the carotid terminus (CT) that were treated with combined IVT and EMT between 2006 and 2011. IVT had to be initiated within 4.5 hours for M1 or CT occlusions and 6.0 hours for BA occlusion.

Results: A total of 120 patients were included (BA: n=52; M1: n=52; CT: n=16). All patients received full-dose intravenous rt-PA within the pre-defined time window. IVT alone led to prompt recanalization in 23 patients (19%). In these patients EMT was abstained from. In the remaining patients with persistent arterial occlusion EMT was attempted. In most cases the Penumbra Stroke System © or the Solitaire Stent © were used as recanalization devices. Overall recanalization was achieved in 101 patients (85%). After three months 26 patients (22%) had died while 64 patients (53%) had a good to moderate functional outcome (mRS <= 3). Data on long-term functional outcome and quality of life will be presented at the conference.

Conclusion: In proximal intracranial artery occlusion early recanalization is only achieved in a minority of patients treated by IVT alone. However, the combination of IVT with immediate EMT leads to recanalization in most and a good to moderate functional outcome in about half of the patients. Randomized clinical trials comparing IVT with IVT+EMT would be very desirable. However, with accumulating data like ours many centres may consider it increasingly difficult to randomize patients for sole IVT treatment.
Thrombolysis and Deferoxamine in Middle Cerebral Artery Occlusion (TANDEM-1). A randomized controlled trial

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Background and Purpose: Iron overload is associated with greater brain injury whereas deferoxamine (DFO), an iron chelator, offers neuroprotection in animal models of cerebral ischemia and reperfusion. We aimed to evaluate safety and prove of concept of efficacy of IV DFO in patients with acute ischemic stroke (AIS) of middle cerebral artery territory treated with IV tissue plasminogen activator (tPA) within 3 hours from symptoms onset. Methods: TANDEM-1 was a placebo-controlled, double-blind, randomized, dose-finding phase II clinical trial (NCT00777140). A single 10mg/Kg bolus of DFO followed by a 72-hour continuous infusion escalating through 20, 40 and 60 mg/Kg/24h (n=15 per group) or placebo (n=5 per group) was initiated within the 1-hour of tPA infusion. A non blinded independent investigator evaluated serious adverse events (SAE) after each dose tier. Primary efficacy endpoint was good clinical outcome (modified Rankinscale ≤ 2) at 90 days. Results: The three parts terminated without crossing the safety stopping rules. Two patients with violation of inclusion criteria were substituted, but considered for safety analyses. Forty-seven patients received DFO and 15 placebo. Mean age and NIHSS score were 66.7 versus 64.6 years and 13.4 versus 17.2. SAE were reported in 13/47 (27.7%) and 4/15 (26.6%) patients. No SAE was related to DFO infusion except a non-fatal anaphylactic reaction. DFO was also discontinued in three patients because of asymptomatic bradicardia (n=2) and early neurological worsening (n=1). Symptomatic ICH (4.3% versus 0%) and mortality (14.9% versus 13.3%) were not different between groups. Good outcome was found in 55.6% of DFO-treated patients (53.3%, 53.3%, 60% for each tier) and in 40% of placebo group. Conclusions: Intravenous DFO initiated during the tPA infusion time is safe and well-tolerated up to doses of 60 mg/Kg/day for three days. These findings provide the basis for a second trial aimed to demonstrate safety and efficacy of DFO.
Background: Several studies indicate that systemic iron overload increases infarct volume in rat models of experimental stroke and associates with neurological worsening in stroke patients1-2. Previous reports from our group demonstrated that iron-loaded transferrin (HT) from the blood extravasates early after the stroke onset to brain parenchyma and that HT is more toxic to postischemic neurons in culture than similar concentrations of free iron3-4. However, the contribution of blood HT to stroke damage remained to date unknown. The objective of this work is to study the role of transferrin during stroke.

Methods: We performed several stroke models in rats by occluding the middle cerebral artery using an intraluminal filament for 90 min (IL), a transient ligature (TL) (60 min) or a permanent ligature (PL). HT (85 mg) was injected i.v. before occlusion in IL rats and the apparent diffusion coefficient (ADC) and diffusion weighted images (DWI) were obtained in a 9.4 T MRI at different times. Apotransferrin (AT) (50 or 100 mg) was injected i.v. at reperfusion in IL and TL rats or 50 min after occlusion in PL rats. A series of neurological tests was given to PL rats before surgery and 24 h later. Rats were sacrificed 24 h after occlusion and the infarct size was assessed.

Results: ADC-DWI mismatch showed that vehicle- and HT-treated IL rats had 287±46 and 33.3±35 mm3 of salvage-
HT worsens whereas AT reduces brain damage and ameliorates neurological outcome after experimental stroke. The present results added to the safety record of AT in its current medical use support the potential of AT as a novel therapy for stroke.


This study was supported by RETICS-RENEVAS RD06/0026.
Background: Sonothrombolysis is a new therapeutic method used in patients with acute ischemic stroke (IS). Various frequencies and intensities of used ultrasound are being tested nowadays. The aim of the pilot study was to assess the safety and efficacy of sonothrombolysis using two diagnostic probes and bilateral monitoring in patients with acute occlusion of the middle cerebral artery (MCA).

Methods: Twelve consecutive IS patients (7 males; age 47 – 78, average 64.1 +/- 9.4 years) with acute MCA occlusion and contraindication to thrombolysis were included in the study. 60-minute bilateral Doppler monitoring of the area of occlusion was performed in all patients (Group 1). Control group consisted of 37 IS patients (20 males; age 32 – 78, average 62.2 +/- 12.1 years) treated with standard sonothrombolysis and selected from the Thrombrotripsy Study database (Group 2). The differences in the number of recanalized arteries after a 60-minute treatment, number of independent patients (defined as a modified Rankin scale [mRS] value of 0 – 2) after 90 days and number of symptomatic intracerebral hemorrhages (SICH) were statistically evaluated.

Results: Complete recanalization was detected in 4 (30.0 %) of Group 1 and in 12 (32.4 %) of Group 2 patients. Seven (58.3 %) of Group 1 and 22 (59.5 %) of Group 2 patients were independent after 90 days. SICH was detected in none of Group 1 patients and in 1 (2.7 %) of Group 2 patients (p > 0.05 in all cases).

Conclusion: According to the results of the presented pilot study, sonothrombolysis using two probes and bilateral monitoring is safe, but not more effective than standard sonothrombolysis in acute IS patients with MCA occlusion.


706 Acute stroke: new treatment concepts

Colony stimulating factors (including erythropoietin, granulocyte colony stimulating factor and analogues) for stroke: a systematic review
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Background
Colony stimulating factors (CSFs) have been shown to be beneficial in experimental stroke. We aimed to assess the effects of CSFs on outcome in patients with acute or subacute stroke.

Methods
The Cochrane Stroke Group Trials Register, EMBASE, Pubmed and Science Citation Index were searched (to October 2011) to identify published, unpublished and ongoing trials. Unconfounded RCTs assessing CSFs or derivatives - erythropoietin (EPO), granulocyte colony stimulating factor (G-CSF) - in patients with acute/subacute stroke were included. The primary outcome was combined death or dependency/disability (modified Rankin Scale or Barthel Index) at end of the trial. Secondary outcomes included death, impairment, deterioration, extension or recurrence, serious adverse events, infec-
Background: Treatment of acute stroke by endovascular recanalization has shown promising results in large artery occlusion. We compared the outcome between patients treated with standard thrombolysis (ST) with patients treated with combined therapy (CT) with lower dose alteplase and endovascular treatment.

Methods: We prospectively registered all patients admitted consecutively to our Stroke Unit during 2010, eligible to thrombolysis, with National Institutes of Health Stroke Scale (NIHSS) score \(>12\) and clinical symptoms of anterior circulation large artery stroke. These patients were submitted to ST during Neurointervention OFF hours or to CT with alteplase 0.6mg/kg and endovascular treatment (mechanical thrombectomy, in-
Acute stroke: new treatment concepts

Optimized tPA Dosing in Correlation with Artery Status: Prospective Study of 3 Doses of tPA

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Background: To improve the efficacy/safety of tissue plasminogen activator (tPA) treatment, a novel dosing/timing tPA administration in correlation with artery status was tested in this pilot study. Methods: This was a non-randomized open-label study with 3 groups (each n=12) of patients with acute ischemic stroke who were to receive tPA doses of 0.8mg/kg/60 min; 1.0 mg/kg/90 min, and 1.2mg/kg/120 min. The infusion of tPA was to be terminated if complete recanalization was diagnosed by transcranial ultrasound (TCCD). The primary safety endpoint was symptomatic intracerebral hemorrhage occurred in 7 (16%) patients in ST group and in 3 (14%) in the CT group (P=NS). 17 (40%) patients were functionally independent (modified Rankin scale <=2) at three months in the ST group and 11 (52%) in the CT group (p=NS).13 (31%) patients died in the ST group and 3 (14%) in the CT group (p=0.2).

Conclusion: Lower-dose intra arterial thrombolysis followed by endovascular recanalization seems to be a safe and effective treatment for acute anterior large artery occlusion. Further studies with larger number of patients are needed.
hemorrhage (sICH) on CT 24–36 h post-treatment. The primary activity endpoint was complete recanalization at 120 min on TCCD.

Results: After 6 subjects were enrolled in the first cohort (median age 70 years and NIHSS 13.5), none had recanalization, and therefore enrollment was stopped due to lack of efficacy. In the second and the third cohort, 12 subjects were enrolled in each (median ages 70.5 and 69.5 years, NIHSS 17 and 10, respectively). All patients had occlusion of the middle cerebral artery with or without occlusion of the terminal internal carotid artery, except one patient in the third cohort who had occlusion of the posterior cerebral artery. In the second and third cohorts, one patient achieved complete sustained recanalization and one had sICH. In 2 patients, (1.2mg/kg) infusion was stopped after recanalization in 30 minutes, but 1 reoccluded.

Conclusion: Lower (0.8mg/kg) or higher (1.2 mg/kg) doses of tPA were safe, but had poor recanalization efficacy.

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Clinical study to Investigate the Safety and Efficacy of NeuroAid on Motor Recovery after Ischemic Stroke

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Objective: To investigate the safety and efficacy of MLC601 (NeuroAideTM) as a Traditional Chinese Medicine on motor recovery after ischemic stroke.

Methods: This is a double-blind, placebo-controlled clinical trial study on 150 patients with a recent (less than 3 month) ischemic stroke. All patients were given either MLC601 (100 patients) or placebo (50 patients), 4 capsules 3 times a day, as an add-on to standard medication of post stroke for 3 months.

Results: Baseline characteristics for gender, age and elapsed time from stroke onset and risk factors were not significantly different between two groups (p>0.05). Repeated measured analysis showed statistically difference in FMA during 12 months between two groups (p<0.001). Patients showed a good tolerability to treatment and adverse events were mild and transient.

Conclusion: MLC601 showed better motor recovery than placebo and was safe on top of standard ischemic stroke medication especially in severe and moderate
than mild patients.

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The Alzheimer’s drug memantine: an adjunct treatment to thrombolysis for stroke

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Background and Purpose – The pathogenesis of stroke is linked to early excitotoxic processes due to an over-stimulation of the N-methyl-D-aspartate glutamatergic receptors (NMDA-R). Despite side effects including over-stimulation of NMDA-R, recombinant tissue plasminogen activator (rtPA) remains the only acute treatment approved so far for ischemic stroke. In parallel, the NMDA-R antagonist memantine is a well-tolerated and currently approved treatment for Alzheimer’s disease. Accordingly, we investigated here whether memantine could be an adjunct therapy to rtPA-induced thrombolysis for stroke.

Methods – Neurotoxicity, calcium videomicroscopy and oxygen glucose deprivation experiments were performed on cultured cortical neurons to study the effects of memantine on a set of neuronal death paradigms. In vitro clot lysis experiments were performed on human plasma. Using high field magnetic resonance imaging (MRI), the influence of memantine either alone or in combination with rtPA was investigated in both an original thrombotic stroke model in mice and an intracranial hemorrhage (ICH) model in mice. Short- and long-term neurological deficits were investigated using actimetry, string test and catwalk experiments.

Results – In cultured cortical neurons, memantine prevented the pro-neurotoxic effects of rtPA. Interestingly, while memantine did not alter the fibrinolytic activity of rtPA in a clot lysis assay, it reduced the noxious action of delayed thrombolysis by rtPA in an original thrombotic stroke model in mice and subsequent neurological deficits. Moreover, memantine provides a greater survival rate in an ICH model in mice.

Conclusion – Altogether, these data suggest that the Alzheimer’s drug memantine could be a safe and effective adjunct therapy for ischemic stroke with rtPA-induced reperfusion, as well as a new treatment for hemorrhagic stroke.

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Self-expanding Solitaire stent in treatment of middle cerebral artery occlusion in acute ischemic stroke patients: Comparison with bridging full-dose IV-IA thrombolysis.

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Background: Early recanalization of the occluded cerebral artery is substantial for good clinical outcome in acute ischemic stroke (IS) patients. Endovascular treatment is now being used in these patients, because intravenous thrombolysis (IVT) has a limited efficacy. The aim was to compare the safety and efficacy of bridging full-dose IV-IA thrombolysis and Solitaire stent in acute IS patients with middle cerebral artery (MCA) occlusion.

Methods: Acute IS patients with MCA occlusion treated either with full-dose IV-IA thrombolysis or with IVT and Solitaire were included in the prospective study. Stroke severity was assessed using National Institutes of Health Stroke Scale (NIHSS), 90-day clinical outcome using modified Rankin Scale (mRS) with good outcome defined as 0-2. Early neurological improvement (ENI) was defined as a decrease of 4 or more NIHSS points after 24 hours. Recanalization was quantified using Thrombolysis in Cerebral Ischemia scale. Symptomatic intracerebral hemorrhage (SICH) was evaluated according to the SITS-MOST criteria. Results: Twenty-seven patients (mean age 67.5 +/- 10.4 years, median NIHSS 17) were treated with IV-IA thrombolysis and 31 patients (mean age 65.5 +/- 16.1 years, median NIHSS 18) were treated with Solitaire stent. Patients treated with Solitaire stent had higher recanalization rate (93.5 vs. 65.4 %, p=0.016) with shorter recanalization time (193 vs. 224 min, p=0.038), presented with more ENI (64.5 vs. 33.3 %, p=0.034) and with lower number of SICH (3.2 vs. 7.4 %, p=0.05). In the Solitaire group, 61.3 % of patients achieved good outcome, while in IV-IA group, 37 %
of patients (p=0.113). 3-month mortality was lower in the Solitaire group (16.1 vs. 40.1%, p=0.045). Conclusion: Endovascular treatment of MCA occlusion using Solitaire stent seems to be safe and more effective than bridging IV-IA thrombolysis in acute IS patients. Acknowledgement: Supported by the grant of IGA MH CR NT/11386-5/2010 and NT/11046-6/2010.

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Thrombolysis outcome in a very elderly (Nanogenarian) patient population. S.C Pattapola, G. Gunathilagan, D Hargroves, I Balogun, G. Thomas Stroke Medicine, East Kent Hospital University NHS Foundation Trust (EKHUFT), UK, Margate, UNITED KINGDOM

BACKGROUND:
Current stroke guidance gives evidence to support thrombolysis of patients aged 18-80 presenting with features of neurological deficit consistent with stroke, within the 4.5 hours window. However we live in a society that has a growing ageing population, with a large number of patients above the age of 80 years presenting with stroke. With current results pending from the International Stroke Trial-3 (IST3), we decided to look at thrombolysis data within our own trust of the very elderly age group defined, for the purposes of this study, as 90 years and above.

METHODS:
Retrospective study of patients aged 90 years or over who were thrombolysed across three district general hospitals within East Kent Foundation Trust. Data was collected from September 2009 to December 2011. The primary outcomes analysed included; bleeding complications of thrombolysis, 30-day mortality and morbidity.

RESULTS:
Twelve patients aged 90 and over were thrombolysed during this period. All were female with an average age of 93. Thirty day mortality was 33%. When looking at morbidity, the number of patients with a bleed was 17%. Thirty-three percent were discharged back to their own home.

CONCLUSION:
Our observation suggests less favourable outcome in nanogenarians compared to 18-80 age group as demonstrated in a previous study presented at the European Stroke conference in 2010. However was in keeping with results from the VISTA study published in British medical journal (mortality of over 80 age group was 32%).

Though a small patient cohort, this data demonstrates age should not necessarily be a contraindication to thrombolysis. We admit that there needs to be further data collected on thrombolysis of the very elderly to ensure mortality and morbidity are not grossly different to that achieved with a younger patient population. Intravenous thrombolysis in nanogenarians demands careful selection of patient for treatment. We need to await IST-3 results for further supportive evidence.
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Neuroprotection in ischemic stroke with citicoline
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Background: Protective strategies in acute ischemic stroke aims at ameliorating the impaired cerebral blood flow such as thrombolysis, ultrasound enhanced lysis, thrombectomy, regulation of blood pressure and treatments which might increase the cellular resistance to the impaired CBF, such as neuroprotective drugs, hyperbaric oxygen and hypothermia. Creational strategies include stem cell transplantation to initiate neurogenesis and functional recovery, differentiation of penumbral precursor cells and the formation of new synapses (synaptogenesis). Stroke doubles the risk of dementia and is a major contributor to vascular cognitive impairment and vascular dementia. The greatest clinical experience with agents that can potentiate brain repair has been gained with choline precursors. Experimentally, citicoline exhibits neuroprotective effect and enhances neural repair, possibly mediated by increased Bcl-2 protein expression decreasing apoptosis, and there was an additive effect of citicoline combined with thrombolysis. Citicoline has no toxic effects even at very high doses, and a potential very long time window, with high concentrations in ischemic brain tissue.

Results: In smaller clinical trials citicoline had a neuroprotective effect in acute stroke and improved cognition especially in memory and behaviour in patients with chronic cerebrovascular disease. In the International Citicoline Trial on Acute Stroke (ICTUS) initiated in October 2006 and expected completed in October 2013, 3350 patients are randomized to citicoline or placebo. Outcome measures are total recovery, modified Rankin Score, Barthel Index and safety and tolerability at 3 months of onset.

Conclusion: Citicoline appears to be a safe and promising alternative to improve stroke recovery and could be indicated in patients with vascular cognitive impairment, vascular dementia, and Alzheimer disease with significant cerebrovascular disease.

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Mechanical revascularisation in acute stroke patients: report from Clinical centre Ljubljana, Slovenia
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University Clinical Centre Ljubljana, Ljubljana, SLOVENIA

Background
Low rates of recanalization, moderate therapeutic efficacy, narrow therapeutic time frame and contraindications of IV tPA in acute stroke (AS) treatment have prompted the evolution of adjunctive methods, especially endovascular mechanical revascularisation (EM). Studies have shown that EM after IV tPA is as safe as EM alone. This article presents the results of all EMs in AS patients hos-
pitalised at our Clinic in 2011.

Methods
Patients with AS due to large vessel occlusion treated with EM were followed retrospectively. We analysed patients’ age, sex, time from symptom beginning to treatment initiation and the usage of bridging. NIHSS at arrival, 24 hours and 7 days after treatment was recorded. Preprocedural CT, CTA and CT perfusion were noted as well as control CT. Clinical outcome at discharge was the main objective.

Results
31 patients were included, 14 men and 17 women. Average age was 64 (27 to 81). Average time to treatment initiation was 231 minutes. Average initial NIHSS was 16 (5 to 30). On initial CT scans, 10 had signs of developing infarction. All (26/26) had a penumbra on CT perfusion. CTA showed 5 ICA, 9 MCA, 2 BA, 14 ICA and MCA and 1 ICA, MCA and BA occlusion. 25 were given IV tPA prior to EMT. 3/25 did not receive a full dose. Average NINDS at 24 hours was 9 (0 to 21), 7 days after thrombolysis 7.5 (0 to 26). Control CT showed small infarctions in 15, large (more than 1/3 of MCA territory) in 13, 3 patients had no infarction. Average modified Rankin scale at discharge was 3.5. 6 patients died of various reasons: a symptomatic massive ICH, diffuse postprocedural vasospasm, retroperitoneal haematoma due to procedural complication and sepsis, pneumonia, in 2 with BA occlusion treatment was unsuccessful.

Conclusion
AS and large vessel occlusion can be successfully treated with IV tPA and EM combination or EM alone in certain cases. To improve EM treatment results better selection of patients is needed. Further studies should be conducted.

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Combiantion therapy of glucocorticoids and proteasome inhibitors as novel treatment option for acute isch-emic stroke

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Background: Brain edema caused by blood brain barrier leakage is detrimental in ischemic stroke and its treatment options are limited. While glucocorticoids potently stabilize the blood brain barrier and ameliorate tissue edema in neoplastic and inflammatory central nervous system disorders, they are ineffective or even harmful in patients with acute ischemic stroke. Our study identifies excessive proteasomal glucocorticoid receptor degradation as an important mechanism causing pharmacological insensitivity of brain microvascular endothelial cells to glucocorticoids under hypoxic conditions.

Methods: In vitro and in vivo, restoration of glucocorticoid sensitivity under ischemic conditions was achieved by inhibition of proteasomal glucocorticoid receptor degradation by Bortezomib accompanied by treatment with the glucocorticoid dexamethasone. In mice subjected to transient middle cerebral artery occlusion, this combination therapy moreover significantly reduced brain edema and infarct volumes, while the respective monotherapy was ineffective.

Results: In mice subjected to transient middle cerebral artery occlusion, this combination therapy moreover significantly reduced brain edema and infarct volumes, and improved neurological outcomes while the respective monotherapy was ineffective.

Conclusions: This combined approach, application of the proteasome inhibitor Bortezomib and the glucocorticoid dexamethasone, might open new avenues for the treatment of brain edema following ischemic stroke.

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Tranexamic acid for acute Intracerebral Haemorrhage (TICH): Baseline characteristics of enrolled patients in a randomised controlled trial

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Background: There is currently no effective treatment for intracerebral haemorrhage (ICH). Tranexamic acid (TA), an anti-fibrinolytic drug, significantly reduced mortality in bleeding patients following trauma in the large CRASH-2 trial. The CRASH-2 ICH sub-study found TA non-significantly reduced mortality and dependency.

Methods: We performed a single centre, double-blind randomised placebo-controlled trial of TA (intravenous 1g bolus, 1g infusion/8 hours) in acute (<24 hours) primary ICH. The primary objective was to test the feasibility, tolerability and acceptability (adverse events) of TA in ICH. Other objectives assessed were the effect of TA on haematoma expansion, and death and dependency. Data are mean (standard deviation) or median [Inter quartile range].

Results: 20 patients (of planned 24) have been enrolled since March 2011. Mean
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To teach to treat - to treat to teach -
Building up a Neuroscience and Rehabilitation Centre 12,000km away

Krankenhaus Nordwest, Frankfurt am Main, GERMANY1, Krankenhaus Nordwest, Frankfurt am Main, GERMANY2, Krankenhaus Nordwest, Frankfurt am Main, GERMANY3, Krankenhaus Nordwest, Frankfurt am Main, GERMANY4, Krankenhaus Nordwest, Frankfurt am Main, GERMANY5, Krankenhaus Nordwest Frankfurt am Main, GERMANY6, Krankenhaus Nordwest, Frankfurt am Main, GERMANY7, Krankenhaus Nordwest Frankfurt am Main, GERMANY8, Jerudong Park Medical Centre, Jerudong Park, BRUNEI DARUSSALAM9, Universiti Brunei Darussalam, Negara, BRUNEI DARUSSALAM10, Universiti Brunei Darussalam, Negara, BRUNEI DARUSSALAM11, Meytec GmbH, Seefeld, GERMANY12, Krankenhaus Nordwest, Frankfurt am Main, GERMANY13, Krankenhaus Nordwest, Frankfurt am Main, GERMANY14

Neurology includes common diseases like dementia and stroke, but a high quality neurological service will always include the whole neurological spectrum. There is a need of neurological centres. It is proven that stroke unit treatment is effective in reducing mortality and disability after stroke, but it’s still not available yet in many countries and particularly in rural areas, even in Europe. Our project in Brunei aims to overcome distances and also offers a long-time benefit for neurological patients. The Project comprises the set up of a specialized stroke unit in Brunei Darussalam, 12,000 km away from KHNW, by a concept ,,to teach to treat - to treat to teach“, a neurological intensive care unit, normal wards and rehabilitation and all labs necessary for neurology (CSFlab, EEG-lab, EMG-lab and ultrasound-lab). Thrombolysis, hemicraniectomies, hypothermia, invasive in-

Age 68 (13), male 13 (65%), baseline systolic blood pressure 165 (22), severity (NIHSS) 15 (9), Glasgow Coma Scale 13 (3), median time from stroke onset to randomisation 16 hours [4-20], time from randomisation to treatment 22 minutes [18-42]. Mean haematoma volume 29.3ml; haematoma locations were thalamic (9 patients), basal ganglia (7 patients) and lobar (4 patients). The Independent Data Monitoring Committee have recommended that the trial continues. The final results will be presented.

Conclusion: Recruitment is ahead of schedule (2 patients/month) showing that the protocol can be delivered, the trial is feasible, and TA appears to be acceptable and tolerable. A larger study is needed to confirm safety and assess efficacy of TA in ICH.
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Appropriate patient selection is key to testing new therapies in acute stroke

A. Shuaib
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Background: There is considerable variation in stroke severity and this together with the time to treatment initiation after an acute stroke can be important factors determining long-term prognosis. Recent studies have shown that patients with moderate severity stroke (NIHSS 8-14), especially if enrolled early, are most likely to show treatment effect. We present post hoc analyses of these determinants on outcomes from the SENTIS trial.

Methods: SENTIS was a randomized, prospective, multicenter trial designed to compare standard stroke treatment with and without NeuroFlo treatment in adult stroke patients with baseline NIHSS scores of 5-18 in whom NeuroFlo treatment could be initiated within 14h of symptom onset. Long-term outcome of functionality was measured with mRS at 90 days. We compared the 90-day mRS outcome in patients with moderate severity stroke (NIHSS 8-14) to patients with severe stroke (NIHSS>14) and early times to randomization (<5h) to longer times (>5h).

Results: The ‘As-treated’ cohort consisted of 487 patients (226 treated; 261 non-treated). NeuroFlo-treated patients with mid-range baseline NIHSS scores and early times to randomization had improved odds of good outcomes (mRS 0-2) at 90 days compared to non-treated subjects (OR=16.47; p=0.013). Neu-
In 2006 endovascular treatment was started at the Medical Centre Haaglanden. We performed a study on outcome and complication rate in all endovascularly treated ischemic stroke patients so far.

**Methods:**
We performed a prospective single centre cohort study of all consecutive ischemic stroke patients who were endovascular treated from January 2009 to April 2011. Part of the data was retrospectively collected. Only patients who suffered from a stroke in the anterior circulation were included. Main endpoints were outcome at 3 months (measured by modified Rankin score (mRS) and complication rate (intracerebral hematoma (ICH) and death). A mRS of 2 or less was defined as good clinical outcome. We used the TICI score to define a technical successful procedure. A TICI score of 2 or more at the end of the procedure was considered successful. For each treatment modality endpoints were calculated separately.

**Results:**
In total 66 patients were treated endovascularly in the defined period.

11 Patients (16.7%) were treated with IAT alone, 13 patients (19.7%) underwent MT alone and 40 patients (60%) were treated with a combination of both. Endpoints subdivided according to method of endovascular treatment are presented in table 1. There was a trend towards better rates of successful recanalization in thrombectomy procedures. In addition, there was a significant association (p= 0.019) between good clinical outcome and successful recanalization.

**Conclusion:**
Post-hoc analysis suggests that the time and severity of symptoms are important determinants to success of investigational therapies. Patients with moderate to severe strokes who present up to 14h after symptom onset benefit from NeuroFlo collateral flow augmentation treatment.

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**Endovascular treatment of acute ischemic stroke; less thrombolitics, less complications?**
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**Background**
Only 5-15% of all patients suffering from acute stroke are eligible for treatment with intravenous thrombolysis. This leads to a search of new, better treatments such as intra-arterial thrombolysis (IAT) and mechanical thrombectomy (MT).

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**Poster Session Blue**
In our cohort, we observed a trend towards better recanalization rates in patients treated with thrombectomy. Successful recanalization was associated with good clinical outcome.

<table>
<thead>
<tr>
<th>Endpoints</th>
<th>IAT alone (n=11)</th>
<th>MT alone (n=13)</th>
<th>IAT+MT (n=40)</th>
</tr>
</thead>
<tbody>
<tr>
<td>mRS ≤ 2 at 3 months</td>
<td>0</td>
<td>7 (53.8%)</td>
<td>15 (37.5%)</td>
</tr>
<tr>
<td>Death</td>
<td>3 (27.3%)</td>
<td>4 (30.8%)</td>
<td>7 (17.5%)</td>
</tr>
<tr>
<td>ICH</td>
<td>2 (18.2%)</td>
<td>1 (7.7%)</td>
<td>8 (20%)</td>
</tr>
<tr>
<td>Successful recanalization</td>
<td>0</td>
<td>11 (84.6%)</td>
<td>30 (75%)</td>
</tr>
</tbody>
</table>

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**Hemodynamic factors influence the effectiveness of neuroprotection in ischemic stroke**

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Saint-Petersburg Pavlov’s State Medical University, Saint-Petersburg, RUSSIAN FEDERATION

**Background**

The study goal was evaluation of the hemodynamic change on the effect of neuroprotection in ischemic stroke (IS). We believe the consideration of this factor could improve statistic data in researches of neuroprotection in IS.

**Methods.**

Open-label study IS outcome and neuroprotection effectiveness depending on the presence of stenosis and occlusion of cerebral arteries. 182 patients with non-embolic IS were included in this study. 75 patients had cerebral arteries occlusion, 42 patients had more than 70% stenosis, and 65 patients had a normal blood flow. The start therapy was at 1 - 6 days after stroke onset (outside the thrombolytic window). All patients received adequate therapy in a stroke unit. Baselines NIHSS and Barthel Index (BI) were similar in subgroups (NIHSS – 8 -17 points, BI – 45-75 points). All patients were prescribed empiric neuroprotective therapy intravenously: magnesium sulfate (25% - 10 ml daily for first 3 days), alpha-lipoic acid (600 mg daily for 5 days) and choline alfoscerat (1000 mg daily from 3 to 10 therapy days). The results were evaluated by NIHSS and BI in % recovery to baseline.

**Results**

By day 28, the worst treatment results were in patients with occlusions: the restoration of NIHSS - 19,9 ± 4,2%, BI - 23,1 ± 5,4%. Better results were in patients with stenosis (NIHSS - 24,1 ± 4,4%, BI - 28,3 ± 6,8%) and maximum results in the restoration of neurological deficits - in the absence of stenosis and occlusions: NIHSS - 42,0 ± 5,6% (p <0.01), BI - 61,1 ± 11,2% (p <0.01).

**Conclusion**

Cerebral atherosclerosis affects the development and course of stroke. Besides the organization of cerebral blood flow changes by collateral type (partially or fully) in patients with occlusions and stenosis which results in disability of effective perfusion of brain tissue in the ischemic zone. We believe hemodynamic factor should be considered in the researches of neuroprotection efficacy in IS.
Evaluation of an intravenous-endovascular strategy in patients with acute proximal middle cerebral artery occlusion

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BACKGROUND AND PURPOSE Intravenous thrombolysis (IVT) administered in acute ischemic stroke provides low recanalization rates in proximal intracranial occlusions, with consequently poor clinical outcome. The safety and efficacy of an intravenous-endovascular strategy (IES) using mechanical thrombectomy after IVT failure were assessed in acute middle cerebral artery (MCA) occlusions.

MATERIALS AND METHODS Patients presenting acute MCA occlusion within 4.5 hours, NIHSS score between 8 to 25 and DWI-ASPECT score>5 were eligible. From September 2009 to September 2010, mechanical thrombectomy using the SolitaireFR® device was systematically performed if no clinical improvement was observed one hour after IVT (IES group). Results in terms of clinical outcome were compared to those from an IVT series from January 2007 to August 2009 (IVT group).

RESULTS Alteplase was administered in 123 patients with proximal intracranial occlusion, 56 had a confirmed MCA occlusion, 32 were included in the IVT group and 24 in the IES group. At 24 hours, the mean NIHSS improvement was 8.0 points in the IES group and 2.8 points in the IVT group (p=0.001). At 3 months, 17/22 (77%) patients from the IES group and 15/30 (50%) from the IVT group had a favorable outcome (mRS<2). After adjustment for confounding variables, IES was strongly associated with favorable clinical outcome (77% vs. 50%, adjOR=11.9, 95%CI:1.6-89.1, p<0.02). No symptomatic intracranial hemorrhage was observed.

CONCLUSION IES using systematic mechanical thrombectomy after IVT failure safely improve the clinical outcome at 3 months and could represent an interesting alternative in the management of patients with acute MCA occlusion.

Afobazole as an effective agent for both stroke prophylaxis and post-stroke treatment at delayed time points

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Our laboratory recently showed that afobazole, an anxiolytic approved for clinical use in Russia in 2005, activates sig-
Afobazole receptors and decreases the death of neurons and microglia caused by in vitro ischemia. Experiments were carried out to determine if afobazole can reduce ischemic stroke damage in vivo using the permanent middle cerebral artery occlusion (MCAO) rat model. Male rats were randomly grouped after MCAO and injected with vehicle (saline) or afobazole at 0.1-30 mg/kg intraperitoneal 3x daily, starting 24 hr post-stroke, until sacrificed at 96 hr. Brains were fixed and six 30 um sections were collected from each brain at equal intervals, from frontal striatum to dorsal hippocampus, and stained with Fluoro-Jade. Fluorescent images of the sections were captured, and infarct volume for each animal calculated by measuring and integrating areas showing neurodegenerative signal. Afobazole in the range 0.3-30 mg/kg was found to significantly decrease stroke volume, with 3 mg/kg afobazole decreasing stroke injury by >66% relative to the vehicle control group. Staining brain sections from these regions with an anti-NeuN antibody confirmed that afobazole enhanced neuronal survival when applied at delayed time points. Similarly, immunohistochemical experiments using an anti-myelin basic protein (MBP) antibody showed that afobazole reduced white matter injury by >57%. Further experiments were carried out to assess the timeline for effective afobazole treatment in stroke. Afobazole (1 mg/kg) was given for one week prior to stroke surgery or post-stroke, with treatments initiated at 3, 6, 12 or 48 hr. Pre-treatment with afobazole produced maximal neuroprotection and decreases in glial cell injury. Analysis of post-stroke treatments showed that late application of afobazole (>12 hr post-stroke) yielded best results. Thus, afobazole shows significant promise as both a prophylactic therapy and for expanding the therapeutic window for post-stroke treatment.

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**Novel composite outcome of ischemic progression and recurrence after acute ischemic stroke – Subsequent ischemic event**


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Background: Most of currently used definitions of stroke recurrence in researches are excluding the acute phase, which might lead to the underestimation of its actual rate. Some criteria including the acute phase are not efficient in differentiating recurrence from stroke progression. We introduce a concept of subsequent ischemic event (SIE) which combines recurrence and ischemic progression based on the idea that both are ischemic in nature and share the pathomechanism and treatment strategies.

Method: We identified the consecutive subject who were admitted the Seoul National University Bundang Hospital due to acute ischemic stroke within 48 hours after onset for 3 years. Sudden onset neurologic deterioration lasting more than 24 hours was defined and captured prospectively up to 1 year according to our institution’s quality-of-care improvement program. Based on brain image, clinical profile and time interval from onset, neurological deterioration attributed to increasing lesion size or newly developed discrete lesions in qualifying territory within 24 hours after onset was classified into progression and that attributed to discrete lesions in other vascular territories or the same vascular territory beyond 24 hours was as recurrence. Both of recurrence and progression were combined into SIE.

Result: A total of 1546 subjects were enrolled in this study. Of them, 254 (16.4%) experienced the SIE; 181 (71.3%), progression and 73 (28.7%), recurrence. The 88.1% of the SIE occurred within the first 7 days and the figure showed its temporal trend. The analysis showed that age, stroke history, interval from onset to admission, initial stroke severity, thrombolysis and symptomatic steno-occlusion (SYSO) were significantly associated with SIE (P<0.05 on the log-rank test). The Cox proportional hazard regression analysis showed that age, stroke severity, stroke history and SYSO were independently associated with of SIE (table).

Conclusion: This paper shows that the substantial proportion of SIE occurs within 1 week after stroke onset. SYSO is the only modifiable risk factor, which warrants future researches urgently.
Table. Cox Proportional Hazards Models Examining the Influence of Risk Factors on Cumulative Subsequent Ischemic Event

<table>
<thead>
<tr>
<th>Variables</th>
<th>Adjusted Hazard Ratio (95% CI)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age &lt; 65 year-old</td>
<td>1 (Reference)</td>
</tr>
<tr>
<td>≥ 65 year-old</td>
<td>1.34 (1.01-1.78)</td>
</tr>
<tr>
<td>Stroke history</td>
<td>1.40 (1.07-1.84)</td>
</tr>
<tr>
<td>OIA</td>
<td>0.69 (0.79-1.01)</td>
</tr>
<tr>
<td>Thrombolysis</td>
<td>1.31 (0.89-1.94)</td>
</tr>
<tr>
<td>Baseline NIHSS score (quartile)</td>
<td>1.21 (1.07-1.37)</td>
</tr>
<tr>
<td>Sydol</td>
<td>1.48 (1.11-1.96)</td>
</tr>
</tbody>
</table>

* Cox proportional hazard model were used and calculated the adjusted hazard ratio. Baseline NIHSS score was analysed by quartile categorization. OIA was abbreviated for time from onset to admission (day). CI for confidence interval, NIHSS for National Institutes of Health Stroke Scale and Sydol for symptomatic steno-occlusion.

Backround
Good outcome at 3 months of acute stroke treated by endovascular treatments is related to successful recanalization, and collateral pial circulation (CPC) in angiography.

We describe a scale (colCTA) for anterior circulation occlusions based on computed tomography angiography (CTA), compare it with CPC status in angiography and analyse whether it can be an independent prognostic factor in endovascular treatment, independently of recanalisation status.

Methods
A 10-point quantitative topographic CTA score in which CPC adds one point is described (graphic 1) and applied to 54 consecutive patients. Logistic regression analysis is performed to find independent favorable outcome predictors in the 54 patients, recanalised and not recanalised. A ROC curve is used to calculate score cutoff points and statistical significance for intergroup differences are analysed. Agreement between colCTA and angiography assessment is tested using kappa statistics.

Results
Cutoff point of 8 in colCTA predicts good outcome (OR 1.83 1.8-2.8). No statistical differences are found in baseline characteristics.

In logistic regression recanalisation and colCTA are independently associated with good outcome, in recanalised patient subgroup only colCTA maintains this status (OR: 12.5 1.8-84.4), while in not recanalised subgroup no association...
is find.
We do not find good agreement between colCTA and angiographic CPC assessment.
Conclusion
A cutoff point of 8 in colCTA predicts good outcome in patients treated by endovascular treatment, specially when recanalisation is achieved.

Table 1.

| PATIENTS’ BASELINE CHARACTERISTICS ACCORDING TO COLLATERAL STATUS IN colCTA |
|-----------------------------|-----------------|-----------------|------------------|
|                            | colCTA <8 (n=27) | colCTA >/= 8 (n=27) | p                |
| Age, y                     | 68.67 ± 11.11    | 65.22 ±13.33     | 0.5              |
| Female gender              | 12 (44.07%)      | 13 (48.15%)      | 0.78             |
| Hypertension               | 21 (74.07%)      | 14 (51.85%)      | 0.09             |
| Diabetes                   | 7 (25.92%)       | 8 (29.63%)       | 0.76             |
| Diabetes                   | 13 (48.15%)      | 12 (44.44%)      | 0.78             |
| Stroke                     | 6 (22.22%)       | 7 (25.93%)       | 0.75             |
| Ischemic cardiopathy       | 6 (22.22%)       | 7 (25.93%)       | 0.75             |
| Previous stroke            | 4 (14.81%)       | 3 (11.11%)       | 1                |
| Left                       | 11 (40.74%)      | 12 (44.44%)      | 0.78             |
| Recanalisation (TICI 2b-3) | 14 (51.85%)      | 12 (44.44%)      | 0.79             |
| Baseline NIHSS             | 17.74 ± 4.23     | 17.19 ±4.07      | 0.57             |
| Recanalisation (TICI 2b-3) | 14 (51.85%)      | 13 (48.15%)      | 0.78             |
| TCD/angiography            | 278 (97%)        | 266 (97%)        | 0.62             |
| Endovascular +pa            | 17 (62.96%)      | 12 (44.44%)      | 0.27             |
| Tandem occlusion           | 7 (25.93%)       | 7 (25.93%)       | 1                |
| M1 occlusion               | 6 (22.22%)       | 7 (25.93%)       | 0.66             |
| M1-M2 occlusion           | 14 (51.85%)      | 17 (62.96%)      | 0.58             |
| Awakening stroke           | 2 (7.41%)        | 7 (25.93%)       | 0.29             |

729 Acute stroke: new treatment concepts

EVALUATION OF GLUTAMATE

ROCE IN THE EFFECT OF TEMPERATURE ON CEREBRAL ISCHEMIA. AN IN VIVO MAGNETIC RESONANCE SPECTROSCOPIC ANALYSIS.
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Background: the association of temperature and release of brain glutamate with infarct volume following stroke is well documented. However, the role of glutamate release as principal mediator of temperature damage on brain tissue has not been clearly established so far (though other mechanisms may be also involved).
In this work we report the study of the ischemic damage under hypothermia with pharmacologically elevated levels of glutamate, and under hyperthermia with pharmacologically reduced levels of glutamate, to unveil the role of glutamate as mediator on the effects of temperature on ischemic damage.
Methods: 60 SD Rats were subjected to middle cerebral artery occlusion. Brain temperature and glutamate levels were monitored in vivo before, during, and 4 h after induction of ischemia, by means of MR spectroscopy. Infarct volumes were measured during occlusion (DWI) and 7 days (T2) after ischemia. Study groups were: (A) Ischemic animals under normothermia (n=7); (B) Ischemic animals
transient ischaemic attack – Why can’t we get it right?
T. Thirugnanachandran, A. Hassan, J. Cooper
Leeds Teaching Hospitals NHS Trust, Leeds, UNITED KINGDOM

Background
In the UK, following a single transient ischemic attack (TIA) the driving and vehicles association (DVLA) guidelines recommend that patients should not drive a group 1 vehicle for one month.\textsuperscript{1}

Methods
A prospective analysis of fifty patients who attended TIA clinic in a six month period in a teaching hospital was performed. Advice given from referrers was reviewed.

Results
50 patients (22F/28M, age range 37-88; mean 65 years). Referrals were mainly from general practice (50%), emergency department (24%), and medical admissions unit (18%).
31 patients (62%) held a driving licence. 13 patients (26%) had driven to their clinic appointment. In 14 patients (28%) who were drivers, a diagnosis of TIA was made from clinic and they were advised not to drive for 1 month. Of these, only one patient had the appropriate advice from the referrer. One was told not to drive until clinic review and another was told to inform the DVLA. 7 patients (14%) diagnosed with a TIA had driven to their clinic appointment. 1 patient had no advice from the referrer and had been involved in a car crash prior to their appointment.

Conclusion
Referrals to TIA clinic come from a va-
the first healthcare contact is essential. Patients with TIA are often seen initially in primary care, yet no tools are available to assist primary care physicians in TIA recognition. We set out to derive such a tool by analysing referrals with suspected TIA using predictors recorded in primary care.

Method: Referrals with suspected TIA from primary care to the Oxford Vascular Study from 2002 to 2006 were studied for symptom content and grouped into categories related to likelihood of CNS dysfunction. A logistic regression model of the outcome of TIA diagnosis (as determined in the specialist clinic) was derived. Scores were created with and without weighting by beta coefficients. Discrimination for TIA was assessed with receiver operating characteristic (ROC) curves.

Results: Of 496 referrals from primary care, 201 (42%) were subsequently diagnosed as TIA. In the final model, positive symptom predictors were speech disturbance and visual loss. Negative predictors were confusion, memory loss, reduced consciousness, unilateral sensory disturbance and nausea/vomiting. Primary care recording of weakness was similar in patients with and without a final diagnosis of TIA (28% vs 23%, p=0.28), partly explained by disagreement with specialists’ records in patients without TIA (kappa = 0.54). Area under ROC curves for TIA diagnosis using weighted and unweighted scores were 0.81 (S.E. 0.02) and 0.79 (S.E. 0.02).

Conclusion: A recognition model from primary care records of patients with suspected TIA did not include a key prognostic feature, which limits its use.

731 Acute cerebrovascular events (ACE): TIA and minor strokes

Improving the recognition of TIA in primary care: Limitations of deriving a recognition tool using the primary care record in patients with suspected TIA

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Background: The high early risk of stroke after TIA is reduced by urgent treatment and so recognition of TIA at the variety of health professionals. Doctors’ knowledge of driving restrictions following a TIA is lacking. It is the responsibility of the referring physician to be aware of driving regulations to inform patients appropriately. As our audit highlights, failure to give patients the correct information can have dire consequences and is negligent. To ensure all referrers are giving patients the correct advice, the referral pathway has now been altered to explicitly include driving advice, and a further audit is planned.

Variety of health professionals. Doctors’ knowledge of driving restrictions following a TIA is lacking. It is the responsibility of the referring physician to be aware of driving regulations to inform patients appropriately. As our audit highlights, failure to give patients the correct information can have dire consequences and is negligent. To ensure all referrers are giving patients the correct advice, the referral pathway has now been altered to explicitly include driving advice, and a further audit is planned.

Poster Session Blue
Background: The aetiology is the main predictor of stroke recurrence in transient ischemic attack (TIA) patients. Nevertheless, the establishment of the aetiology is difficult when a cardioembolic origin (CE) or a stenosis more than 50% in a symptomatic vessel is excluded. The aim of our study was to determine the evolution of patients without mechanism-specific (non CE nor vascular stenosis>50%).

Methods: Between April 2008 and December 2009, we included 1,255 consecutive TIA patients from 30 Spanish stroke centres (PROMAPA study). A neurologist treated all patients within the first 48 h after symptom onset. The duration and typology of clinical symptoms, vascular risk factors and etiological work-ups were prospectively recorded. We determined the early short-term risk of stroke (at 7 and 90 days). Cox proportional hazards multivariate analyses However, the model had good discrimination suggesting further research is warranted. In order to provide a recognition tool for clinicians at initial healthcare contact, more general populations with transient symptoms should be studied, rather than those selected by primary care suspicion of TIA.
determining independent predictors of stroke recurrence at 90 day-follow-up were calculated. Results: Seven-day and 90-day stroke risks were 2.6% and 3.8%, respectively. We identified a specific etiological mechanism (SEM) in 443 (39.6%) patients: symptomatic stenosis on carotid or intracranial imaging >50% in 190 patients (16.7%). Patients without SEM were younger (66.8[SD 13.3] vs 70.1 [SD 12.6], p<0.001) with less proportion of hypertension (59.3% vs. 68.8%, p=0.001) and previous coronary heart disease (12.0% vs. 22.2%, p<0.001). Also, classical lacunar syndromes (CLS) were more frequent in patients without SEM than in patients with SEM (38.0% vs.24.2%, p=0.001). Stroke recurrence (SR) at 90-day follow-up was significantly higher in SEM patients than in patients without SEM (6.1% versus 2.6%, p=0.002). In patients without SEM, we observed that only prior TIA within 7 days, present in 22.8%, was an independent predictor of stroke recurrence (hazard ratio 3.16, 95% CI 1.28-7.7, p=0.012). The 90-day risk of SR in patients without SEM and prior TIA was higher than in patients without SEM and a unique episode (5.7% vs. 1.8%).

Conclusion: Patients without SEM but with multiple episodes have a similar stroke recurrence risk as those with SEM. One of every four patients with a CLS had a SEM.

733 Acute cerebrovascular events (ACE): TIA and minor strokes

Prevalence and Presentation of Migraine in TIA Clinic
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Introduction: Migraine is commonly mistaken as Transient Ischaemic Attack (TIA) by non specialists. A good history and interpretation of symptoms are essential to diagnosis. The aim of this study is to evaluate frequency of migraine diagnoses in TIA clinics, the role and relevance of ABCD2 score and imaging results in this subgroup.

Method: Referral letters from Primary Care and emergency Department (ED) physicians were collected from Jan-Dec 2011. An analysis of symptomatology, age, gender, ABCD2 score on referral, MRI findings, and stroke risk factors was done.

Result: A total of 441 patients were referred to the clinic, 431 were seen, 10 did not attend. Out of 431, 56 (12.6%) were diagnosed as migraine by specialists in clinic; 73% were GP referrals and 14% from ED. Male to female ratio was 4:10. The age range was 22-86 years with prevalence peaked in middle life [31-69 yrs]. Of all,
29 had ABCD2 score of <4, 8 scored >3 and 19 had no score recorded. Visual aura was present in 75%, 43% had sensory symptoms, 14% had motor symptoms, 27% had speech disturbance and 64% had headache and a combination of symptoms. A significant percentage (48%) had >1 risk factor for stroke. Out of 77% who had MRI scans, 56% were normal, 21% had white matter abnormalities (WMA), and 21% had small vessel disease. Three scans showed acute/sub-acute infarcts.

Conclusion: The prevalence of migraine in a TIA clinic is common. The ABCD2 score is specific for TIA, however 21.6% of migraineurs evaluated had scores \( \geq 4 \), which questions its specificity.

As in previous studies, increased risk of WMA in the migraine population is demonstrated. Key features identified in the history suggestive of migraine were headaches or positive symptoms. Speech disturbance was not a discriminatory feature.

Limitations of the study include its retrospective nature and small number of patients. Migraine presentation in TIA clinic significantly impacts on the clinic workload and resources for the evaluation of true TIA.

734 Acute cerebrovascular events (ACE): TIA and minor strokes

PREDICTION OF EXTRACRANIAL VASCULAR EVENTS IN PATIENTS WITH TRANSIENT ISCHEMIC ATTACK


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Background: Determinants of risk of extracranial vascular events (EVE) after transient ischemic attack (TIA) are not well defined. The aim of our study was to determine the risk and risk factors for EVE (coronary heart disease [CHD] and peripheral arterial disease [PAD]) after TIA.

Methods: We prospectively recruited patients within 24 hours of transient ischemic cerebrovascular events between October 2006 and June 2011. A total of 560 TIA patients were followed for six months or more. EVE and stroke recurrence (SR) were recorded. The duration and typology of clinical symptoms, vascular risk factors and etiological work-ups were prospectively recorded and established prognostic scores (CHADS2, CHADS2-VASC2, ABCD2, ABCD3I, california risk score, Essen Stroke risk score, Stroke Prognosis Instrument were calculated

Results: 31 (5.9%) EVE (22 CHD and 9 PAD) and 63 (11.9%) recurrent strokes occurred during a median follow-up period of 30 months. Discrimination for the prognostic scores only ranged from 0.60 to 0.70. The incidence of EVE did not varied among the different etiological subtypes. In Cox proportional hazards multivariate analyses we identify alcoholism (Hazard Ratio [HR] 3.66, 1.10-
Methodology
The study was a prospective qualitative study using the patient questionnaire
The patient experience questionnaire were given to 100 consecutive patients who attended the Fastrack TIA clinic.
Data collection using the template used by the clinical audit department and analysis using SPSS

Results
Of the 100 questionnaire sent to consecutive patients only 51 were returned and analysed. Majority were referred by General practitioners [78%], 20% by accident & emergency and 2% by the Eye Department. After seeing the initial clinician, 58% were seen in the TIA clinic within 48 hrs and 38% within 3-7 days. Only 53% [35% within 24 hrs & 18% within 24-48 hrs] of the patients approached medical facility within 48 hrs of onset of symptoms. Of the patients who approached the medical facility >2 days 41% of patients did not know symptoms of TIA/Stroke and 41% of patients did not think it was serious enough to contact the medical facility.

Discussion
Even though majority of the patients who had TIA, were seen and assessed in the clinic within 48 hrs of referral, nearly half of the patients did not approach the medical facility within first 48 hrs. Two main reasons for the delay in the presentation to the medical facility were in relation to the patients understanding of the nature and seriousness of the condition. The public needs educating on the importance of contacting the emergency medical services immediately after TIA.

12.13, p=0.034), hypercholesterolemia (HCL) (HR 3.77, 1.84-7.72, p<0.001), motor weakness (HR 1.73, 1.20-2.50) and the presence of carotid plaques (HR 1.29, 1.07-1.56, p=0.007) as independent predictor of EVE.

Conclusion: According to our results, discrimination was poor for all previous risk prediction models. Variables like alcoholism, HCL, motor weakness and carotid plaques should be considered in new prediction models.
736 Acute cerebrovascular events (ACE): TIA and minor strokes

Amaurosis fugax as a risk factor for ischemic cerebrovascular disease
HUCA, Oviedo, SPAIN

Background: Amaurosis fugax is frequently related to internal carotid artery (ICA) disease. It is not unusual that after a proper study a plausible cause for the event cannot be found. We present a review of 77 cases, with a focus on idiopathic forms.

Material and methods: 36 males and 41 females were included, all hospitalized between September 2001 and October 2010 after suffering a transient monocular visual loss. We reviewed their medical files as well as subsequent medical evolution.

Results: In 40 patients no etiology was found and they were labeled as idiopathic. 14 patients had an ipsilateral ICA disease: two 50-70% stenosis, six 70-90% stenosis, four preocclusive stenosis and two occlusions. A patient presented both atrial fibrilation and ipsilateral preocclusive ICA stenosis. Funduscopic study was performed in 82% of patients, with normal results. All cases with a non-occlusive ipsilateral ICA disease were submitted for either endarterectomy or angioplasty. Patients diagnosed as idiopathic received empirical treatment with antithrombotic medication (AAS, clopidogrel or triflusal). Ischemic recurrence (amaurosis fugax, TIA or stroke) was similar in both groups, 18.4% in the amaurosis fugax group versus 21.4% in the ICA disease group (p<0.05)

Conclusion: Idiopathic forms are frequent in our case series though this result may be overestimated. It is remarkable the similar ischemic recurrence registered in both the carotid artery disease and idiopathic groups. Although this is a retrospective study and it has no control group, we could infer that idiopathic amaurosis fugax probably masks an ischemic etiology or it should at least be considered a risk factor for ischemic cerebrovascular disease. Thus empirical antithrombotic treatment is justified in patients with amaurosis fugax of un-
known origin.

737 Acute cerebrovascular events (ACE): TIA and minor strokes

TIA – THE RISK OF ISCHEMIC STROKE
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Introduction: Transitory ischemic attack (TIA) is an important predictor of the occurrence of ischemic stroke. The literature data show that three-month risk of ischemic stroke after TIA is about 12%, half of which occurs within first two days. The aim of this study is calculation of two-day risk of ischemic stroke in the patients with TIA.

Methods: One hundred forty consecutive patients with TIA were admitted at the Clinical Center Kragujevac emergency department from 1 January - 31 December 2010 and were analyzed. Demographic and clinical characteristics and ABCD2 score for each patient were recorded. Complete diagnostic procedure was performed in all patients (physical exam, CT scan or MRI of the brain, ultrasound of the neck, and echocardiogram of the heart) and all patients received antiplatelet drugs.

Results: In the observed period, the total of 140 patients, 71 males (50.71%) and 69 females (49.29%) had TIA. The average age was 69.11 years for males and 68.19 for females. Median ABCD2 score was 4. Definitive stroke was found in 16 patients (11.43%), 9 males (56.25%) and 7 females (43.75%). Five patients had ischemic stroke within first 48 hours, while eleven patients had stroke within three months. Patients with stroke within two days had significantly higher ABCD2 score compared to those with stroke within three months.

Conclusion: Our preliminary results of the occurrence of IBA in the patients with TIA are in accordance with the literature data. ABCD2 score was a good indicator of the risk of IBA in the patients with TIA.

Key words: TIA, stroke

738 Acute cerebrovascular events (ACE): TIA and minor strokes

Is 9 point diagnostic tool useful in the diagnosis of TIA and minor strokes?
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Background:
Diagnostic tools are not routinely used for the diagnosis of TIA. Dawson et al(1) developed a simple clinical scoring system (Table 1) which performed well in the diagnosis of TIA.(Sensitivity of 97%). They had proposed 2 cut off values of >6.1 and >5.4 for the diagnosis of TIA. The lower cut off of >5.4 showed greater sensitivity and lower specificity and was better in reducing the risk of missing TIAs. Authors had called for independent external validation.
We sought to evaluate the diagnostic utility of their tool in the diagnosis of TIA in our population.

Methods:
Medical records of consecutive patients seen in the TIA clinic over a 6 month period were reviewed and the 9 point score was calculated. We used the clinical diagnosis made during the visit as the reference standard and characterized the groups as cerebrovascular (TIA and minor strokes) and non-cerebrovascular. We determined the total number of patients with cumulative scores of >5.4 and >6.1.

Sensitivity, specificity and positive and negative predictive values were calculated for total scores of >5.4 and >6.1 separately.

Results:
Total: 279 patients. 136 were males and 143 were females. Age ranged from 23 to 95 years with a mean age of 67.7 years. Of the 279 patients, 119 were cerebrovascular and 160 were non–cerebrovascular.

The sensitivity, specificity, positive and negative Predictive Values for a cut off of >5.4 were 94.1%, 28.1%, 49.3% and 86.5% respectively. 5 out of 7 false negatives were amaurosis fugax. For a cut off >6.1, they were 87.3% 56.8%, 60.1% and 85.8% respectively.

Conclusions:
Our results were comparable to the study by Dawson et al (1) thereby providing further evidence for the diagnostic utility of 9 point score. A cut off of >5.4 provides enough sensitivity to be used as a good screening tool and thereby has the potential to be used for prioritising the referrals to be seen urgently in TIA clinic.

References

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<th>If No</th>
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<tbody>
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<td>History of stroke or TIA</td>
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<td>0</td>
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<tr>
<td>Headache</td>
<td>0</td>
<td>0.5</td>
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<td>Diplopia</td>
<td>1.2</td>
<td>0</td>
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<td>LOC/Pre-syncope</td>
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<td>1.1</td>
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<td>Seizure</td>
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<td>Speech abnormalities</td>
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<td>Unilateral limb weakness</td>
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<td>UMN facial weakness</td>
<td>0.6</td>
<td>0</td>
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<tr>
<td>Age</td>
<td>Multiply by 0.04</td>
<td>To calculate the score, all values should be summed</td>
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</table>

Table No 1: 9 point diagnostic score

739 Acute cerebrovascular events (ACE): TIA and minor strokes

Introduction of a Stroke Physician On-call (SPOC) service and centralisation of stroke services leads to improved care of TIA patients on an ambulatory care pathway
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Background
The UK has seen a drive to increase Stroke Physician numbers and improve management of TIA patients in order for low-risk patients to receive Stroke Specialist assessment within 7 days and
high-risk patients within 24 hours. Our objective was to assess achievement of these targets before and after major service changes, namely the centralisation of stroke services across two large teaching hospitals in Northern England and the introduction of the SPOC service.

Methods
We analysed two 3-month periods in 2010 and 2011; before and after the two changes described above. The following criteria for each data set were measured; ABCD2 score (low risk; 1-3, high risk; 4 or more), investigations (carotid duplex and neuro-imaging), treatment, patient destination, TIA clinic attendance and SPOC review.

Results
36 TIA patients were analysed in 2010 and 58 in 2011; age range 27 - 99, 50:50 male:female. More patients were admitted to stroke and neurology units in 2011 (40% vs 8%), rather than Acute Medicine, where they did not receive a SPOC review. There was a 71% increase in high risk patients being assessed within 24 hours and more discharged home within 24 hours (17% vs 0%). Consequently, there was a 48% reduction in patients attending TIA clinic, as only low risk patients were referred.

More patients received appropriate treatment with anti-platelet (97% vs 62%) and lipid-lowering drugs (69% vs 61%). More had carotid duplex scans in 2011 (71% vs 50%) and within 24 hours (63% vs 50%), particularly in the high risk group (50% vs 36%). In 2011 more had neuro-imaging (53% vs 36%), with greater use of MRI.

Conclusions
The introduction of the SPOC service and centralisation of stroke services have led to clear improvements in the care of TIA patients. More high risk patients are evaluated within 24 hours on our new ambulatory care model, therefore avoiding hospital admission in almost a fifth, with more capacity for low risk patients to be assessed in TIA clinic within 7 days.
lines.

Methods
We devised 2 websurveys which we sent to all UK stroke clinical leads and Radiology Directorates in May 2011 via multiple routes (Royal College of Physicians, NHS Improvement Stroke, UK Stroke Networks, Scottish NHS Boards, Welsh Health Dept and UK Imaging Networks) with reminders. For patients with suspected TIA/minor stroke, we sought information on clinic frequency, staffing, casemix, type, and timing of brain/carotid imaging, and endarterectomy rates.

Results
114 Stroke Services and 146 Imaging Facilities surveys were completed (both 45% response rate). 97% of respondents had a specialist stroke service for TIA/minor stroke. In most centres, 40-60% of referred patients had a final diagnosis of TIA/minor stroke. Clinics were consultant-lead in 80% of centres and nurse-lead in 20%. Most centres had access to CT (94%) or MRI (88%), but CT was routinely used, 9am-5pm, in 84% of centres and MRI in 51%. Most centres performed CT on the same day (87% for in- and 59% for out-patients), but not MRI (37% for in-, 23% for out-patients). MRI was delayed up to 2 weeks for out-patients in 26% of centres. Out of hours, CT was available in most centres (82%) but not MRI (19%). Most centres used DWI and either TI/T2 or FLAIR but only 48% used blood sensitive (GRE/T2*) sequences.

Conclusions
Services for TIA/minor stroke are widely available in the UK but structure varies. Workload is inflated by many non-TIA/minor stroke patients. CT is the most common imaging investigation. Although MRI is available in many centres 9am-5pm on week days, delays of many days are usual and key sequences to exclude haemorrhage are commonly omitted, reducing the potential benefit of MRI in stroke prevention.

741 Acute cerebrovascular events (ACE): TIA and minor strokes

Review of a TIA Outpatient Service at Addenbrooke’s Hospital, Cambridge, UK

Addenbrooke’s Hospital, Cambridge, UK, Cambridge, UNITED KINGDOM

Background The ABCD2 score was devised to predict the risk of stroke in patients presenting with a transient ischaemic attack (TIA). Addenbrooke’s Hospital has an open referral system to TIA clinic. A standardised proforma categorises patients into those scoring <4 on the ABCD2 score (who are seen in clinic) and those scoring ≥4 (either admitted or seen in TIA clinic).

Methods We reviewed the database of patients attending TIA clinic from July 2008 to August 2011. We analysed data looking at sources of referral, ABCD2 score at event, relevant investigations performed and if secondary prevention had been started. We also noted the final diagnosis from TIA clinic. Results Data was available on 1944 patients from July 2008 and August 2011. 71% were referred by GPs, 17% by the Emergency
Background: Most studies did not specifically address the characteristics of older patients with TIA. We aimed to assess whether patients with TIA had different clinical presentations and outcomes according to age.

Methods: Prospective cohort of patients evaluated in a TIA Clinic between March 2004 and March 2011. We compared the clinical characteristics, etiology, and the risk of recurrence of cerebrovascular events up to 30 days after TIA according to age (<70 years, 70-80 years, >80 years). The same comparisons were performed between patients under and over 80.

Results: 356 patients with TIA, with a mean age of 67.1 years old: 195 patients <70 y, 96 patients between 70-79 y, 65 patients >80 y. Hypertension increased with age (66.7% vs. 77.1% vs. 79.7%, p<0.05) and smoking habits decreased (22.6% vs. 6.3% vs. 0%, p<0.01). Those over 80 years had more frequently aphasia (31.1% vs. 9.8%, p<0.01), and less often sensitive symptoms (15.4% vs. 41%, p=0.008). The frequency of patients with the ABCD2 score≥4 increased with age (64.8% vs. 76.0% vs. 93.8%, p<0.001). Patients over 80 years had more frequently carotid stenosis >50% (14.1% vs. 5.8 %, p=0.022), and no significant difference in cardioembolic disease (13.1 vs. 17.2%, p=0.387). Cerebrovascular events up to 30 days did not differ with age (9.7% vs. 13.5% vs. 11.3%, p=0.570), although there was a trend for an increased stroke risk (2.7% vs. 6.5% vs. 6.5%, p=0.244).

Conclusion: Elderly patients had clinical
Acute cerebrovascular events (ACE): TIA and minor strokes

Performance of diagnostic tools in distinguishing TIA or minor stroke from mimics in consecutive referrals to a specialist neurovascular clinic.

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Background: Urgent management in specialist neurovascular clinics reduces stroke risk after transient ischemic attack (TIA). However, up to 60% of referrals to specialist services from emergency or primary care physicians have non-neurovascular diagnoses (mimics). Diagnostic tools may reduce mis-referral rates. We tested the performance of a previously proposed diagnostic tool for TIA (Dawson et al.) and compared it with two commonly used diagnostic tools for stroke (ROSIER and FAST) in patients with suspected TIA or minor stroke.

Methods: The three diagnostic tools were applied to consecutive patients with suspected TIA or minor stroke referred over one year to a specialist neurovascular clinic in a university hospital. The gold standard was diagnosis of TIA or stroke determined by the attending neurologist. Performance was assessed with sensitivity, specificity, likelihood ratios for positive (LHR+) and negative (LHR-) results and areas under ROC curves (AUCs) analysis.

Results: 779 patients were studied (mean age 70 years, 49% male), 414 (53%) with TIA or minor stroke and 365 (47%) with mimics. The TIA diagnostic tool had a sensitivity of 82% (95% CI 79- 86) and specificity of 42% (37- 47) (LHR+ 1.43; LHR- 0.42): using a lower cut off to adjust for the seriousness of missed true TIA, sensitivity increased to 95% (93- 97) but specificity fell to 20% (16-24) (LHR+1.20; LHR- 0.23). The ROSIER score had a sensitivity of 86% (83- 90) and specificity of 42% (37- 47) (LHR+ 1.50, LHR- 0.32). The FAST tool had a sensitivity of 63% (59- 68) and specificity of 51% (46- 56) (LHR+ 1.29, LHR- 0.72). AUCs for the three tools were 0.70 (0.67- 0.74), 0.68 (0.64- 0.72) and 0.60 (0.56- 0.64) respectively.

Conclusion: The TIA diagnostic tool and the ROSIER score performed better than the more commonly used FAST test. Given their high sensitivity but low specificity, the tools may have utility in screening and reducing mis-referrals to specialist neurovascular services.

Acute cerebrovascular events (ACE): TIA and minor strokes

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C-Reactive Protein is not associated with vascular recurrence after Transient Ischemic Attack

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Background: Although C-reactive protein (CRP) has been proposed as a biomarker for prognosis after stroke, it is unknown whether increased CRP is associated with the prognosis of TIA patients. We aimed to analyze the relationship between CRP levels and vascular recurrence after TIA.

Method: We prospectively evaluated 328 consecutively TIA patients referred to a TIA Clinic. High-sensitive CRP levels were measured within 24-48 hours after the TIA. The associations between increasing levels of CRP and outcomes were evaluated according to a cutoff point (median) and to the relative risk category of CRP recommended by the AHA (low risk, <1mg/L; average risk, 1 to 3mg/L; and high risk, >3mg/L). The primary outcome was a vascular composite end point (stroke, TIA, myocardial infarction or vascular death) at 1-year; secondary outcomes were stroke at 30-days and 1-year of follow-up.

Results: CRP levels were available in 189 patients, with a median value of 2 mg/L (IQR 1-4) (<1mg/L in 17 patients, 1-3 mg/L in 97 patients, >3 mg/L in 75 patients). The primary endpoint occurred in 28 patients (15%). CRP values were not associated with prognosis, both when analyzed according to the median values (16.6% vs. 13.7%, P=0.26) or in relation to cardiovascular risk groups (6% vs. 17.5% vs. 13%, P=0.64). Sensitivity analyses excluding patients with infection yielded the same results. CRP was not included in the model predicting vascular events at 1-year follow-up (Diabetes (HR=2.29; P=0.02), carotid artery stenosis >50% (HR=3.02, P=0.001) and cardioembolism (HR=2.75; P=0.004). Stroke occurred in 5 patients (2.6%) at 30-days and in 10 patients (5.3%) at 1-year. CRP values were not associated with these outcomes, according to the median values or with groups in relation to cardiovascular risk.

Conclusions: The association between CRP values and vascular recurrence risk after TIA was not confirmed. Larger studies are required in subgroups of patients, as those with atheromatous disease.

745 Acute cerebrovascular events (ACE): TIA and minor strokes

Early management of transient ischemic attack in a community hospital
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Background: Early risk of stroke after a transient ischemic attack (TIA) is high, so an urgent study of these patients is needed. Over the past years, several ways for an urgent assessment have been implemented, specially in hospitals with a 24 hours/day neurologist, in order to detect higher risk patients and avoid in-hospital admission of all TIA patients.

Methods: In our hospital, neurologist
is present from 8:00 am to 5:00 pm. In March 2007 we set up a rapid management protocol for patients with acute TIA consistent symptoms. They are visited by a neurologist each weekday morning immediately after their arrival to emergency room, and carotid and transcranial doppler are performed in order to detect patients at risk, whose admission is recommended. We analyze our results since protocol implementation, with particular focus on 3-month stroke recurrence rates analysis, specially in those patients not admitted after rapid neurological assessment.

Results: Three-hundred and eighty-four patients were studied, final diagnosis was TIA in 260 (67.7%). In a 94.8% of patients neurological assessment and neurovascular study were carried out within the first 48 hours of arrival to emergency room. Severe large-artery stenosis was detected in 6.15% of patients. After neurological evaluation, immediate admission to hospital was decided in 26.5% of patients (more frequent reasons: persistent symptoms, crescendo TIA, cardiopathy, severe stenosis of a large artery). After 3 months, incidence of ischemic stroke in all TIA patients was 3.85% (70% of them, within the first week). In the same follow-up period, of the patients not admitted in the hospital, only one (0.63%) suffered a stroke.

Conclusion: In a hospital without a 24 hours/day available neurologist, an early assessment and management of TIA patients is possible, according to guidelines, avoiding in-hospital admission in most of the cases, without increasing recurrence rates.

### 746 Acute cerebrovascular events (ACE): TIA and minor strokes

**Risk prediction of early stroke recurrence in patients with transient ischemic attacks (TIAs) using symptom fluctuations as compared to ABCD2 and ABCD3-I scores.**

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Background: Prognostic clinical scores [ABCD2 and ABCD3-I, which includes diffusion-weighted imaging (DWI) and carotid stenosis \(>=50\%\)] as well as specific clinical signs and symptoms (e.g. fluctuations) have been used to predict early stroke risk in patients admitted to hospital after early onset of TIAs. We directly compared their utility for prognosis and outcome.

Methods: 235 patients with TIAs admitted to our Comprehensive Stroke Center entered the study. Diagnosis of TIA was made using the common criteria within 24 hours after onset. Patients were repeatedly neurologically scored (NIHSS) within 6 hours time frames and underwent prompt brain imaging for visualization of early signs of ischemia.

Results: Among 235 patients (130; 55.3% men, mean age 66.1±13.9 years), 17 patients (7.2%) experienced an early stroke during hospitalization (mean duration 7.4±2.7 days). ABCD2 score failed to predict early stroke (\(p=0.544\)): 5/17 (29.4%) were in the “low risk”, 10/17 (58.8%) in the “moderate risk” and 2/17 (11.8%) in the “high risk category. In
contrast, ABCD3-I score correlated with early stroke recurrences (p=0.021); 1/17 (5.9%) were in the “low risk”, 14/17 (82.3%) in the “moderate risk” and 2/17 (11.8%) in the “high risk” category. Positive DWI (6/17; 35.3%) and carotid stenosis (3/17; 17.6%) failed to predict early stroke alone or in combination with symptom fluctuations (4/17; 23.5%). Symptom fluctuations alone showed the best prediction for early stroke after TIA: 13/17 (76.5%) patients showed fluctuations (p<0.001).

Conclusions: As shown earlier, symptom fluctuations are an excellent and easily accessible parameter to individually predict a high early stroke risk, better than both the ABCD2 score and ABCD3-I score. This parameter also performs better than DWI and carotid imaging. Interestingly, the combination of these parameters does not improve prediction performance.

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The characteristics and outcomes in transient ischemic attack patients with chronic kidney disease

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Background: Few studies documented the association of transient ischemic attack (TIA) patients with low estimated glomerular filtration rate (eGFR). This study was aimed to clarify characteristics and outcomes in TIA patients with low eGFR who were enrolled from a multicenter retrospective study by the Japan TIA Research Group registry.
Methods: Of all consecutive 464 TIA patients admitted to 13 stroke centers in Japan within 7 days after onset between January 2008 and December 2009, 354 TIA patients were evaluated after exclusion of patients with premorbid modified Rankin Scale (mRS) >0 and patients with eGFR <30 mL/min/1.73m². TIA was defined as neurological symptoms ascribable to a vascular etiology lasting less than 24 hours, irrespective of the presence of DWI lesions. Outcomes were stroke events during hospitalization and functional outcome at 30 days using mRS. Subjects were divided into 3 groups, corresponding to the eGFR levels of ≥90 (Group 1), 60 to 89 (Group 2), 30 to 59 (Group 3) mL/min/1.73m².

Results: Of 354 TIA patients (240 men, age of 67.0±13.2 years old, eGFR of 74.0±20.1), 72 patients (50 men, 56.5±15.1, 103.9±14.1) were divided into Group 1, 193 patients (117 men, 67.3±11.3, 73.4±7.8) into Group 2, and 89 patients (56 men, 74.9±9.3, 51.0±8.0) into Group 3. By univariate analyses, significant differences among 3 groups were found in age (p<0.001), hypertension (56%, 65%, and 78%. p=0.010), atrial fibrillation (AF) (7%, 16%, and 25%. p=0.007), and systolic BP (149±25, 159±29, and 152±26 mmHg, p=0.017). For outcomes, there was a significant difference among 3 groups in mRS >0 at 30 days (1%, 4%, and 16%. p<0.001), but not in stroke events during hospitalization (p=0.197). After adjustment for multiple confounders, lower eGFR per 10 (OR 0.55, 95%CI 0.37-0.78, p<0.001) was correlated with mRS >0 at 30 days.

Conclusion: Acute TIA patients with low eGFR had more hypertension, AF and poor functional outcome than those with high eGFR.
clinical characteristics of TIA patients with AF could facilitate in identifying AF as the etiology of the TIA and optimize appropriate antithrombotic therapy.

Methods: We studied a prospective cohort of TIA patients in eight tertiary-care EDs over 5 years as part of a larger decision rule study. Patients were classified with AF based on their presenting 12-lead ECG, subsequent holter monitor, echocardiogram or history of previous AF. Primary outcome was stroke within 90 days, secondary outcomes were TIA and MI within this period. All events were adjudicated by a blinded committee. Standardized clinical variables were recorded by physicians on data collection forms prior to disposition. We conducted univariate analysis for clinical findings in TIA patients with and without AF.

Results: 3,298 (77.6% of eligible) patients were enrolled; 379 (11.5%) had AF. Patients with AF were older (76.5 years vs. 66.9, p=<0.001) and had more co-morbidities: history of stroke/TIA (21.5% vs. 12.4%, p=<0.001), ischemic heart disease (31.3% vs. 17.1%, p=<0.001), heart failure (13.0% vs. 1.6%, p=<0.001), or valvular heart disease (9.8% vs. 2.7%, p=<0.001). TIA patients with AF presented with more speech symptoms (53.0% vs. 38.8%, p=<0.001), but less sensory symptoms (36.4% vs. 47.5%, p=<0.001). Those with TIA and AF had increased findings of cerebral atrophy (31.4% vs. 17.3%, p =<0.001) on CT imaging. TIA patients with AF had an increased risk for subsequent stroke (6.2% vs. 3.1%, p=0.004) and death < =90 days (5.0% vs. 1.2%, p=<0.001).

Conclusion: TIA patients with AF are at higher risk of stroke and mortality within 90 days. TIA and AF were more frequently found when patients presented with speech symptoms, previous history of stroke/TIA, ischemic/valvular heart disease or heart failure. Clinical detection of AF related TIA may help elucidate the etiology of TIA and guide appropriate therapy.
Acute cerebrovascular events (ACE): TIA and minor strokes

A questionnaire survey on the knowledge and management of transient ischemic attack of general physicians in Japan

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Background:
Patients with transient ischemic attack (TIA) often contact general physicians (GPs) at first. The purpose of this survey is to clarify the knowledge and current status of management of TIA in GPs.

Methods:
We sent a questionnaire to 835 GPs in the Hokusetsu area (the northern part of Osaka prefecture), with a population of approximately 1.8 million.

Results:
We obtained 329 responses. About the number of patients with TIA visiting clinic per year, 58% of GPs answered “1-5 patients” and 19% did “more than 6 patients”. For symptoms suggesting TIA, GPs chose dysarthria (90%), hemiplegia (85%), aphasia (83%), as well as syncope (60%). For important factors relating to TIA, GPs chose atrial fibrillation (81%), hypertension (72%), history of stroke (71%) and diabetes (70%), but not frequently “hypertension at presentation (37%)” although it is an essential item of the ABCD2 score. 70% of GPs felt some difficulty with clinical practice on TIA, including insecurity about the diagnosis of TIA, unfamiliarity with referral timing, and having no referral.
Risk factors assessment of recurrent stroke in patients with minor ischemic cerebrovascular events

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Background: Risk factors assessment of recurrent events in Transient Ischemic Attack (TIA) and Minor Ischemic Stroke (MIS) patients has great importance.

Methods: Consecutive TIA or MIS patients referring to Ghaem hospital, Mashhad enrolled in a prospective cohort study during 2010-2011. Only those presenting within 24 hours from the onset of symptoms were recruited. MIS was considered as ischemic stroke with NIHSS<4. The end point of the study was a new ischemic cerebrovascular event or vascular death at 90 days and additionally at 3 days. The relations between 20 probable factors with recurrent ischemic events at 3 and 90 days was investigated by univariate and multivariate analysis.

Results: Three hundred ninety three TIA patients (238 males, 155 females) and 118 MIS patients (77 males, 41 females) enrolled the study. 117 strokes (23.2%), 99 TIA (19.6%), and 11 vascular death (2.2%) occurred within 3 months post event in whole of our 511 patients with minor ischemic events. Crescendo TIAs and multiple TIAs were associated with 5-fold and 4-fold greater risk of stroke at 3 days in a univariate analysis (OR=5.120; 95%CI=3.137-8.356, p=0.000) and (OR=3.988; 95% CI=1.536-10.353, p=0.003) respectively. Patients with index stroke had 11.5% lower risk of recurrent stroke at 3 days than patients with index TIA in multivariate analysis (OR=0.115, df=1, p=0.039). Diabetes was significantly associated with 3 months stroke recurrence in logistic regression analysis of our patients with minor ischemic events, (OR=2.655, df=1, p=0.039).

Conclusion: Multiple and crescendo TIAs is the main predictive of stroke recurrence, derived in univariate analysis of our patients with minor ischemic events.
Acute cerebrovascular events (ACE): TIA and minor strokes

Susceptibility-Weighted Imaging in Hemispheric Transient Ischemic Attack with Negative Diffusion-Weighted Imaging

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Background: Diffusion- and perfusion-weighted imaging (DWI & PWI) can show abnormalities in patients with transient ischemic attack (TIA). Susceptibility-weighted imaging (SWI) can detect the area of impaired perfusion, because it can show the hypointense signals of draining veins due to increased deoxyhemoglobin in acute cerebral ischemia. However, the role of SWI in patients with TIA is not well known. We evaluated the role of SWI in DWI-negative hemispheric TIA and explored the usefulness of SWI in diagnosis of hemispheric TIA.

Methods: We included clinically definite TIA patients consecutively. TIA patients with symptom or signs of posterior circulation ischemia were excluded. Precise clinical history, vascular risk factors and symptom duration were recorded. DWI, PWI, SWI and MR angiography were done in all patients. We divided into DWI positive and negative in hemispheric TIA patients. SWI, PWI and MRA were analysed in DWI-negative patients.

Results: Forty patients had clinical diagnosis of TIA in study period. Eight patients were TIA associated with posterior circulation. Among thirty-two hemispheric TIA patients, nine were DWI-negative. Four patients showed prominent hypointense vessels or thrombus on SWI in DWI-negative patients. All of these patients showed perfusion defects on PWI in the area with hypointense SWI vessels and occlusion/stenosis or decreased branch of relevant arteries on MRA.

Conclusion: SWI of TIA patients with negative DWI can show hypointense vessel signs, which was excellent accordance with PWI defect. SWI vessel signs can be a useful marker for detecting the hypoperfused cerebral tissue, which maybe present oligemic area in acute TIA patients. The use of SWI on top of DWI/PWI can provide enhanced diagnostic value in patents with suspected TIA.
Results:
Out of 5 low risks TIA who had imaging, 1 (20%) was DWI positive and 4 were negative DWI. Whereas in high risk TIA 13 (45%) were DWI positive and 16 were DWI negative. Total of 34 out of 60 patients had MRI and we have calculated the yield in different group and outcome in different group in relation to duration of symptoms.

Conclusion:
Higher numbers of positive MRI DWI lesion were seen in high risk TIA compared to Low risks TIA. It changes the diagnosis and considered as an indicator of prognosis. It is questionable whether to MRI everyone routinely with suspected TIA rather than in selective or doubtful patients, could benefit in providing true diagnosis and outcome. Further outcome and cost effective model based research is needed in this field.

Background:
In England 20,000 people have Transient Ischaemic Attack (TIA) each year according to time-based traditional definition of 1960s. National Institute for Health and Clinical Excellence (NICE) suggest that People with a suspected TIA who are at high risk of stroke in whom vascular territory or pathology is uncertain should undergo urgent brain imaging (preferably MRI with DWI) within 24 hours of onset of symptoms. It is debated that few patient with clear clinical diagnosis of TIA miss out benefit of MRI in this protocol. TIA patients with an infarct on MRI stand an increased risk for subsequent TIA and stroke. We assessed the patients who were diagnosed with TIA and DWI positive lesions in the MRI.

Method:
We prospectively analysed 60 patients who attended Southend Hospital in 2011 with the diagnosis of TIA. Out them 48 were high risk and 12 were low risk based on ABCD2 score. Out of 12 low risk patients 5 (42%) had MRI imaging and out of 48 high risk TIA 29 (60%) had MRI imaging according to NICE guidelines.
21. European Stroke Conference

We determined relative proportions and prognoses of TIA, minor stroke, major stroke and TIA/stroke-mimics in a population-based study. METHODOLOGY: We studied all patients ascertained from 2002-2010 in a prospective population-based study of all patients with possible TIA or stroke (Oxford vascular study). TIA was defined based on symptoms lasting >/=24 hours and major stroke as NIHSS>3. Two-year risk of recurrent stroke was determined by face-to-face follow-up. RESULTS: Of 2678 patients initially ascertained as possible TIA or stroke (52.8% female; mean age, 71.7 years; SD, 14.8), 616 had a non-cerebrovascular diagnosis. Of 2062 acute cerebrovascular events, 766 (37.1%) were TIA (mean age 72.3 years; SD, 13.2), 740 (35.9%) were minor stroke (72.4; 13.5 years) and 556 (27.0%) were major stroke (77.6; 12.4 years). Among 189 recurrent strokes at 90 days follow-up, 176 (93.1%) occurred in patients who presented initially with TIA or minor stroke. Of 323 recurrent strokes during 2-year follow-up, 294 (91.1%) occurred in patients who presented initially with TIA or minor stroke. CONCLUSION: Acute TIA and minor stroke are each more common than major stroke and together account for over 70% of all acute cerebrovascular events and suffer about 90% of all recurrent strokes. Clinical guidelines, provision of services and public education tend to focus on major stroke, but must also take into account the very large clinical burden of “minor” cerebrovascular events.
Introduction: The CHADS2 score is used to assess the risk of stroke in patients with atrial fibrillation (AF). We investigated whether the CHADS2 score predicted mortality and cardiovascular events in stroke patients without atrial fibrillation.

Methods: Consecutive non-AF patients registered in the Athens Stroke Registry between 1988 and 2011 with an acute first-ever ischemic stroke were classified into three groups according to their CHADS2 score (low: 0, intermediate: 1-2, high: >/=3) and were followed up to 5 years. The endpoints were death and major cardiovascular events.

Results: Among 1757 patients (mean age 67.2±12.3, 68.2% males), there were 262 (14.9%), 1127 (64.1%) and 368 (20.9%) patients with low, intermediate and high CHADS2 score respectively. The probability of 5-years survival was significantly different between the three groups: 83.5% (95%CI: 78.2-88.8%) for the low-score, 70.5% (95%CI: 67.2-73.8%) for the intermediate-score and 64.6% (95%CI: 58.9-70.3%) for the high-score group (p<0.001 by the log-rank test). In the Cox-proportional hazard

Conclusion: IL 6 has important role in determination of severity of ischemic stroke patients. Also patients' outcome affected by IL 6 concentrations. But IL 2 didn’t provide further information.

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CHADS2 score predicts post-stroke mortality and cardiovascular events in stroke patients without atrial fibrillation

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METHODS: Patients aged 15-45 yrs with confirmed IS and entered into Stroke Registry of National Institute of Neurology in Mexico City, treated among January 1990-October 2006 with at least 5 yrs follow-up, were included. All patients were assessed for vascular risk factors. We categorized stroke based in TOAST classification. Follow up was through clinical evaluation in outpatient. Primary outcomes were: (1) nonfatal or fatal recurrent IS; (2) nonfatal or fatal myocardial infarction (IM), other arterial thrombotic events.

RESULTS. 325 patients were included (mean age, 33.10 ± 8.0 yrs; 50.5% female). The main vascular risk factors were: tobacco use (27%), dyslipidemia (17%), HTA (14%), and DM (8%). In univariated analyses none vascular risk factor was associated with recurrence. The stroke etiology agrees to TOAST classification was: Other determined etiology in 154 cases (47.5%, 66 patients had non-atherosclerotic vasculopathies and 88 hypercoagulable states), Indeterminate 76 (23.3%), cardioembolism 67 (20.8%), large-artery atherosclerosis 19 (5.8%) and small vessel disease 9 (2.9%). The mean follow-up was 123 months (60-312). 52 patients (16%) had recurrence; one had a fatal MI other amaurosis fugax, 50 (15.3%) had recurrence of IS (47 nonfatal and 3 fatal). The mean interval among IS and stroke recurrence was 43.9 months. In 30 (9%) cases recurrence occurred during first year. In multivariate analyses none type of stroke was associated with recurrence. There were 15 deaths, 3 due to stroke, one by IM, and the remaining other causes. 95% of patients are alive at 5 years.
CONCLUSION. Stroke young patients have high risk of recurrent IS during the first year of follow-up. We didn’t find association between the vascular risk factors or subtype of stroke and stroke recurrence.

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Prognostic Factors for Disability in Patients with Acute Cerebellar Hemorrhage
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Background
Prediction of the long term functional outcome is mandatory in stroke rehabilitation setting to provide effective rehabilitation programs. But it is problematic to predict future functional status in patients with infratentorial lesion in their acute stage.

In this presentation, we report the relationship between the functional outcome and various prognostic factors which could be observed in our cerebellar hemorrhage patients.

Methods
Study participants were consecutive acute cerebellar hemorrhage patients who admitted to our hospital from May 2005 to April 2011. We chose following predictive factors and outcome indicator from our medical records retrospectively. As prognostic factors, we selected patient’s age, Glasgow Coma Scale on admission, and CT findings (size of the lesion and presence or absence of ventricular hemorrhage). As the outcome indicator, we adopted Functional Independence Measure (FIM) score, version 3 Japanese edition. We identified significant predictive factors by stepwise multivariate regression analysis.

Results
The participants were 43 patients. The age was 41 to 96 years old (mean 71.7). FIM at discharge were 18 to 126 (mean 80.5). Significant predictive factors of FIM elucidated by multivariate regression analysis were GCS, patient’s age and presence of ventricular hemorrhage. Their standardized coefficients were 0.476, -0.376 and -0.250, respectively. Its adjusted R square was 0.601.

Conclusion
GCS, patient’s age and presence of ventricular hemorrhage were significant predictive factors for functional outcome in patients with cerebellar hemorrhage. Among those predictive factors, GCS had the highest impact on the outcome. The functional outcome could be predicted to some extent using our regression model. We intend to improve the precision and the feasibility of this prediction model in the clinical setting through continuation of the survey in our subsequent prospective study.
Prestroke antiplatelet therapy and early prognosis of stroke patients. The Dijon Stroke Registry
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Background: Many patients are under antiplatelet therapy (APT) at the time of their first-ever stroke. We aimed to evaluate the prognostic value of prestroke APT use on early prognosis of stroke patients.

Methods: All cases of first-ever stroke were prospectively identified from the population-based Stroke Registry of Dijon, France (150,000 inhabitants), from 1985 to 2009. Demographic features, risk factors, prestroke treatments, and clinical information were recorded. Multivariate analyses were performed using logistic and Cox regression models to evaluate the associations between admission APT use and both severe handicap at discharge, and one-month mortality.

Results: Of the 3832 recorded stroke patients, 778 (20.3%) were under APT. A severe handicap at discharge was noted in 207 (26.6%) APT users, and in 870 (28.5%) nonusers. In multivariate analyses, no significant association was found between severe handicap and APT use. Kaplan-Meier estimates of survival rates among stroke patients did not reveal any difference between APT users and nonusers. In multivariate analysis, a trend toward a protective effect of APT use on one-month death was observed (HR=0.85, 95% CI: 0.68-1.07; p=0.18).

In stratum-specific analyses, APT use was associated with a lower risk of death in patients with cardioembolic ischemic stroke (HR=0.59, 95% CI: 0.38-0.91; p=0.16).

Conclusion: We demonstrated a trend toward a beneficial effect of prestroke APT use, that was significant in patients with cardioembolic stroke. Further studies are needed to understand the underlying mechanisms and the reason for the distinct effects observed across the ischemic stroke subtypes.

Predictors of in-hospital outcome in patients with ischemic stroke
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Background: Several studies reported different predictors of outcome in patients with acute ischemic stroke, including cardiovascular risk factors and stroke severity. However, it is unclear which one is the strongest predictor. We aimed to assess the predictors of in-hospital outcome in patients admitted with acute ischemic stroke.

Methods: We pro-
pectively studied 133 patients (39.8% males, mean age 77.9±6.6 years) who were hospitalized in our Department for acute ischemic stroke between September 2010 and September 2011. The main endpoint was dependency on exit from the hospital defined as a modified Rankin scale score ≤2. Results: On exit from the hospital, 43.7% of the patients were dependent. These patients were older than patients who were non-dependent on exit from the hospital (79.9±5.9 vs. 76.1±7.1 years, respectively; p<0.01) and had lower systolic blood pressure on admission than the latter (141.9±19.9 vs. 156.1±24.6 mmHg, respectively; p<0.005). The prevalence of other risk factors for ischemic stroke did not differ between the two groups. Patients who were dependent on exit from the hospital had higher National Institute of Health stroke scale (NIHSS) score on admission than non-dependent patients (10.0±7.1 vs. 1.8±1.9, respectively; p<0.001). In binary logistic regression analysis, NIHSS score was the only independent predictor of dependency (risk ratio 1.75, 95% confidence interval 1.29-2.37, p<0.001). Conclusion: The severity of stroke on admission to the hospital, assessed with the NIHSS score, is the strongest predictor of in-hospital outcome in patients with ischemic stroke. Dependency also appears to be associated to patients’ age and systolic blood pressure on admission.

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HEART RATE VARIABILITY AND CARDIOVASCULAR EVENTS IN POST-STROKE PATIENTS
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Background: Post-stroke patients referred higher risk group of recurrent stroke, myocardial infarction (MI) and cardiovascular death. Autonomic imbalance expected to predict cardiovascular complications after stroke. We aimed to study relationship between the heart rate variability (HRV) as autonomic balance marker and incidence of the cardiovascular events after ischemic stroke.

Methods: We consequently included 164 patients (104 male; aged 59 [53; 68] years) with sinus rhythm at 21 day after ischemic stroke for long-term follow-up. At baseline low frequency (LF) and high frequency (HF) components of HRV spectral power were analyzed with 24-hour Holter monitoring. Primary outcome was a composite of recurrence stroke, TIA, MI, unstable angina pectoris and vascular death. Data are given as Me [Q1; Q3].

Results: Mean follow-up was 21 [15; 44] month. Primary outcome was recorded in 38 (23%) patients (1 group). Remainder 126 (77%) patients consisted 2 group. Both groups were follow-up period duration, smoking, carotid and vertebral atherosclerosis, stroke subtype, Rankin scale score, diabetes mellitus, cardiac arrhythmias, therapy compliance comparable. But 1 group patients were elder (65 vs 58 years, p<0.01), more frequently...
suffered from previously stroke (29% vs 13%, p<0.05) and coronary artery disease (CAD) (47% vs 27%, p<0.02) as against 2 group. The HRV spectral power values were lower in 1 group as compared with 2 group: HF 38 [25; 132] ms2 vs 96 [46; 188] ms2 (p<0.05), LF - 195 [94; 466] ms2 vs 415 [212; 767] ms2 (p<0.01), respectively.

Conclusion: Thus, 23% post-stroke patients had cardiovascular complications an average after 21 month. The signs of unfavorable prognosis are elderly age, previously stroke, CAD and reduced spectral power HRV.

Stroke prognosis

IN-HOSPITAL MORTALITY AND ASSOCIATED FACTORS – FINAL RESULTS OF THE HELLENIC STROKE REGISTRY

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Hellenic Stroke Registry Trialists
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Background: Short-term stroke outcome data from Greece are scarce. Aim of this study was to evaluate in-hospital mortality in the setting of a prospective multicenter nationwide acute stroke registry.

Methods: Demographics, risk factors, stroke severity, medications and death during hospitalization were documented in a total of 2660 acute stroke patients hospitalized in 25 participating centers. Multivariate logistic regression analysis was used for determining parameters related to in-hospital death.

Results: Our collective consisted of 87.5% ischemic and 12.5% hemorrhagic stroke patients aged 71.2±13.5, mostly men (57.5%). NIHSS-score on admission was 9.7 ±7.9 and mean duration of hospitalization lasted 9.7 ±8.3 days. In-hospital death occurred in 372 cases (14%). Increasing age (HR 1.03; 95%CI: 1.01-1.04) and admission NIHSS-score (HR: 1.17; 95%CI: 1.15-1.19) were both significantly associated with in-hospital mortality. Treatment in Stroke Units seems to have a better survival (HR: 0.69; 95%CI: 0.43-1.11), while patients treated in Internal Medicine Departments had the worst (HR: 2.80; 95%CI: 1.035-7.58). Interestingly, hospitalization in a university teaching hospital, compared to state hospitals, was significantly associated with better survival (HR: 0.451; 95%CI: 0.33-0.62). Stroke subtype and history of TIA's were also independent predictors of mortality.

Conclusions: It seems that the place of hospitalization of acute stroke patients is an important predictor plays of in-hosp-
Background and Purpose—Atrial Fibrillation (AF) is a major risk factor for ischaemic stroke and its prevalence increases markedly with age. With ageing of populations in high income countries, the societal burden of AF-associated stroke is projected to increase. Population-based data on late fatality and functional outcome of AF-associated stroke are required to develop health policy and service approaches to respond to this increasing need. We aimed to investigate late outcomes of AF-associated stroke in the North Dublin Population based Stroke Study.

Methods—The NDPSS is a prospective cohort study in 294,592 Dublin residents. Over a 5-year follow up period we quantified fatality and functional outcome (Modified Rankin Scale (mRS)), in patients with AF and stroke (all stroke and ischaemic only) which occurred in the ascertainment period (2005-2006).

Results—177 patients had AF related stroke. Of these 160 (90.4%) were ischaemic, 13 (7.3%) had intracerebral haemorrhage, 3 (1.7%) were subarachnoid haemorrhages and 1 (0.6%) was undetermined. In 172/177 (97%) with available data, the 5-year case fatality rate was 61.6% (95% CI 54-69%).

5-year functional status was available for 89.4% (59/66) of survivors. Of these 66.1% (95% CI 53-78%) were independent (mRS 0-3) and 42.4% (95% CI 30-56%) had good outcome (mRS 0-2). 72% of survivors were living at home while 26.2% required either institutional accommodation. In 60/66 survivors (91%) with data available, 45% were on warfarin, 46.6% anti-platelet agent, 70% on antihypertensive, and 68% statin
Conclusions—5-year survival after AF-stroke was 38.4%, compared to 56% for colorectal, 79% for breast and 88% for prostate cancer. Among survivors, almost 60% had disability and one-third were dependent, with one-quarter in nursing home care. Prevention of AF associated stroke must be an international public-health priority, supported by policy measures and funding.

**763 Stroke prognosis**

**Effect of depression on mortality of stroke people who were poor but had high level of social support**  
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Background: People with stroke often have depression. Previous studies, mainly from western countries reported an association of the coexisting with higher mortality, leaving its mechanism unclear. We determined the association in a Chinese population who had high levels of stroke and socioeconomic deprivation but low level of psychosocial factors.

Methods: In 2001-03 using a standard method of interview we examined 2977 people aged ≥ 60 years in Anhui, China, having documented doctor-diagnosed stroke and GMS-AGECAT diagnosed depression (subcases and cases) at baseline. They were re-interviewed one year later, and followed up for vital status was over 5 years. A Cox regression model was used to calculate hazards ratio (HR) of mortality in relation to individual and combination of depression and stroke.

**Results:** There were 565 deaths; compared to participants without stroke and depression at baseline or one-year follow up, there was an increased risk of mortality in patients with only depression (age, sex and socio-demographic factors adjusted HR of 1.25, 95%CI 1.00-1.55), in patients with only stroke (2.04, 1.48-2.83) and in those with both stroke and depression (2.52, 1.63-3.89). The matched HRs in further adjustment for social support and cardiovascular disease were 1.18 (0.94-1.46), 1.96 (1.40-2.73) and 2.14 (1.36-3.36). Data analysis excluding depression subcases showed similar patterns of increased mortality (Table). Conclusions: In China both stroke patients with and without depression had a similarly increased mortality. Slightly higher mortality in stroke patients with depression might be explained by psychosocial factors, suggesting the effective interventions can be developed and tested to reduce post-stroke mortality.

<table>
<thead>
<tr>
<th>Stroke and depression at baseline and 1-year follow up</th>
<th>No. of death (participants)</th>
<th>Mortality (%)</th>
<th>HR (95%CI)</th>
<th>P</th>
<th>HR (95%CI)</th>
<th>P</th>
<th>HR (95%CI)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>No stroke without depression</td>
<td>441 (2546)</td>
<td>17.1</td>
<td>Reference</td>
<td>Reference</td>
<td>Reference</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depression only</td>
<td>90 (264)</td>
<td>22.7</td>
<td>1.51 (0.95)</td>
<td>0.08</td>
<td>1.30 (0.82)</td>
<td>0.21</td>
<td>1.29 (0.81)</td>
<td>0.16</td>
</tr>
<tr>
<td>Stroke only</td>
<td>52 (217)</td>
<td>18.3</td>
<td>1.50 (0.95)</td>
<td>0.08</td>
<td>1.15 (&lt;0.01)</td>
<td>0.05</td>
<td>2.03 (&lt;0.01)</td>
<td>0.01</td>
</tr>
<tr>
<td>Both stroke and depression</td>
<td>13 (38)</td>
<td>38.7</td>
<td>1.37 (&lt;0.01)</td>
<td>0.01</td>
<td>2.26 (&lt;0.01)</td>
<td>0.03</td>
<td>1.31 (0.46)</td>
<td>0.16</td>
</tr>
<tr>
<td>Total</td>
<td>662 (2547)</td>
<td>19.7</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

Table 3. Number of deaths and hazard ratio among participants with and without stroke and depression (case only) in the Anhui cohort study, China.
Women fare better - gender-specific long-term outcome after acute basilar occlusion

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Background: Gender may influence outcome and efficacy of recanalization therapy in acute stroke. However, existing data are controversial and mostly refer to anterior circulation stroke.

Methods: In this monocentric retrospective study we analyzed gender-specific mortality and long-term functional outcome in all consecutive patients that had been treated for acute basilar artery occlusion (BAO) in our institution between 12/2002 and 12/2009.

Results: We could identify 91 patients: 57 male patients (63%, mean age 64.9 +/-10.8 years) and 34 female patients (37%, mean age 58.3 +/- 18.3 years). All of them had received multi-modal recanalization (MMRT) therapy with intravenous thrombolysis (IVT), intra-arterial thrombolysis, mechanical thrombectomy or a combination of these treatment modalities. After a mean observation time of 4.2 +/-2.1 years 51 patients had died: 38 of the 57 men (67%) and 13 of the 34 women (38%). Among the 35 long-term survivors 10 of 17 male patients (59%) and 16 of 18 female patients (89%) had a good to moderate functional outcome (modified Rankin Scale (mRS) <=3).

Backward stepwise logistic regression identified female gender (p = 0.001, Odd’s Ratio 11.385, CI 95% 2.748-47.179) as a strong predictor for favorable functional long-term outcome (mRS <= 3), independently of the covariables age, comorbidity and presence of large-artery atherosclerosis.

Conclusion: In our acute BAO patients treated with MMRT women seem to have a lower mortality and a better functional long-term outcome than men. Further prospective trials and meta-analyses will be necessary to confirm these findings and identify underlying causes.
Background: Time to recanalizing treatment (TTT) is an important prognostic factor in patients with anterior circulation stroke treated by intravenous thrombolysis (IVT). A similar effect of TTT may be expected in patients with basilar artery occlusion (BAO) treated by multi-modal recanalization therapy (MMRT) including IVT and endovascular approaches (intra-arterial thrombolysis and mechanical thrombectomy). However, reliable data are scarce.

Methods: In our single-center retrospective study long-term outcome was analyzed in patients with confirmed BAO admitted between 12/2002 and 12/2009 and treated by MMRT. Good outcome was defined as a modified Rankin score (mRS) from 0-3 and finally related to TTT. Results: A total of 91 patients (mean age 62.7 years, range 20-89 years) were included. All of them had received MMRT with IVT, IAT, mechanical thrombectomy or a combination of these treatment modalities. After a mean interval of 4.2 +/- 2.1 years a mRS could be obtained in 86 patients, 49 of those had died. A good outcome was reached by 15/32 patients treated within three hours (46.9%), 9/39 patients treated beyond three and up to six hours (23.1%), 2/8 patients treated beyond six and up to nine hours (25.0%) and 0/7 patients treated beyond nine hours (0%) (see figure). This negative correlation of TTT with good outcome was significant (p=0.010; OR for TTT ≤ 3h 2.036, CI 95% 1.211-3.425). If treatment was initiated beyond nine hours none of the patients survived in the long-term (0 of 7 patients).

Conclusions: TTT seems to be an important prognostic factor in patients with BAO and MMRT. If treatment can be initiated within three hours, about half of the patients seem to have a good long-term outcome. If treatment is delayed beyond nine hours chances for a meaningful recovery and even survival seem to be very small.
Stroke prognosis

Prognostic value of perfusion CT maps in acute ischemic stroke: a qualitative and quantitative assessment
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Background: Uncertainty remains about the prognostic value of CT perfusion (CTP) maps in patients with acute stroke. Methods: 62 patients (32 male and 30 female; mean age = 68.1 +/- 11.6 years) with ischemic stroke in the middle cerebral artery territory were imaged within 9 hours of symptom onset by unenhanced CT (NCT) and CTP scans (64-section CT scanner, GE Healthcare). Alberta Stroke Program Early CT Score (ASPECTS) was calculated on the affected hemisphere using the cerebral blood flow (CBF), cerebral blood volume (CBV) and mean transit time (MTT) CTP maps in two ways: subtraction of 1 point for: 1) each visually detected area with CBF, CBV and MTT defects; 2) abnormal CTP values measured within multiple cortical circular regions of interest, according

Figure: Percentage of patients with favorable long-term outcome (mRS ≤ 3) (A) and percentage of dead patients at long-term follow up (mRS ≥ 6) (B) with respect to time to treatment (IVT or intra-arterial therapy) in hours (h) in 86 BAO patients
with the previously established thresholds [CBF \leq 24.6 \text{ ml.(min-1)(100gr-1)}; 
CBV \leq 1.1 \text{ ml.(100gr-1)}; 
MTT > 145\% 
of contralateral side]. The final infarct 
volume was measured on follow-up NCT 
7 days after onset. National Institute of 
Health Stroke Scale (NIHSS), modified 
Rankin scale (mRS; good outcome \leq 2 
and poor outcome > 2) were recorded 
at admission and at 3 months, respecti-
vatively. Results: An inverse correlation 
was found between both qualitative and 
quantitative CBF, CBV and MTT AS-
PECTS and final infarct volume, admi-
sion NIHSS and 3 month mRS (Table). 
The area under the curve (AUC) for the 
Receiver Operating Characteristic analy-
sis revealed that the CBF, CBV and MTT 
ASPECTS optimal cut-off points identi-
fying good outcome were > 5, > 8 and > 
5 (AUC = 0.724, 0.749 and 0.693) and > 
5, > 9 and > 2 (AUC = 0.754, 0.682 and 
0.793) for qualitative and quantitative as-
sessment, respectively. Conclusion: Our 
findings suggest that qualitative CTP AS-
PECTS evaluation represents a powerful 
method for predicting clinical and tissue 
outcomes in acute stroke patients. These 
results were confirmed and validated by 
their substantially agreement with quan-
titative CTP ASPECTS assessment.

### End of life pathway in Stroke - Time for a rethink

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**Background**

Early withdrawal of care and DNAR orders within 24 hours of stroke are independ-
tently associated with increased short- and long-term all-cause mortality after stroke. Patients with severe or large strokes are often subject to ‘do not resuscitate’ (DNAR) orders and ‘end of life care pathways’ (EOLC) despite. Over the last few years we have seen patients admitted with large strokes who have been put on the EOLC pathway very early on after their stroke, but have subsequently improved and been success-
fully rehabilitated.

**Methods:** We analysed 543 patients over six months and out of these 31 were put on the EOLC pathway. The indications for EOLC in these individuals were analysed. We illustrate twelve patient sce-
arios involving stroke patients where withdrawal of treatment at the outset has led to improved outcome and subsequent successful discharge from hospital.

**Results:** Of these 31 patients, 12 (age 69-82 yr) survived and improved. Main reasons for EOLC were poor premorbid state, deep coma, a high NIHSS score and mass effect on brain scans. Contrary to expectations of the treating team pa-
tients regained consciousness and were successfully rehabilitated and discharged from hospital. All the patients and fami-
lies were pleased with the outcome.

Conclusion: These cases raise important ethical and therapeutic questions regarding the validity of introducing EOLC/DNAR orders ‘too early’ after an acute stroke. Research has confirmed the power of ‘self fulfilling prophecies’ (‘the Oedipus effect’) in promoting adverse outcomes in the field of medicine. Physicians often predict fatal outcomes in certain patients and subconsciously or consciously try to fulfil them. By predicting ‘end of life’, we actually prolonged it, completely defying the prophecy. Withdrawal of treatment and of intravenous fluids at the outset of a large stroke may reduce cerebral oedema and improve outcome. Compassionate dignified care should not be forcing stroke patients into becoming victims of a self fulfilling prophecy. A rigorous philosophy of EOLC in stroke patients is required.

768 Stroke prognosis

**Influence of cognitive decline no dementia on outcome 3 month after intravenous thrombolysis for cerebral ischaemia.**

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Background: many ischaemic stroke patients eligible for thrombolysis have preexisting cognitive, but there is no study which evaluated the influence of mild cognitive decline on the outcome after thrombolysis. Our objective is to determine whether ischaemic stroke patients with cognitive decline no-dementia have worse outcomes after thrombolysis. Methods: in 510 consecutive patients treated with rt-PA for ischaemic stroke, 106 (50.9% male, median age 68 years) met inclusion criteria for our study. We included patients with a modified Rankin Scale (mRS) 0-1 before stroke and not demented before stroke (diagnosed by specialists or IQCODE). Results: 40 of 106 patients had cognitive decline no-dementia. They were older (median 73 vs. 65 years, p=0.005) and had more dyslipidemia (OR: 2.67; 95% CI: 1.17-6.08), and less cardio embolic strokes (OR: 0.38; 95% CI: 0.16-0.90). They had a lower rate of mRS 0-1 at 7 days (OR: 0.35; 95% CI: 0.15-0.83) and mRS 0-2 of 3 months (OR: 0.40; 95% CI: 0.18-0.91). However, their mortality rates at 7 days and 3 months, and rate of symptomatic intracerebral haemorrhage
(sICH) did not differ. Conclusion: patients with cognitive decline no-dementia did not differ for sICH and mortality but have worse outcomes. This suggests that low capacity to recover from brain injury contributes more to the worse outcome than sICH.

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Very Long-term Cognitive Performance in Young Stroke Patients: A Prospective Cohort Study


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Background:
Studies on cognitive outcome after ‘young stroke’ (between 18 and 50 years) are scarce, have limited follow-up duration, small sample sizes and investigated ischemic stroke patients only. Post-stroke cognitive consequences are particularly important in young patients as most of these patients have a long life-expectancy and it very much determines ability to work and running a family.

Objective:
To investigate the very long term cognitive performance in young stroke patients.

Methods:
We performed a prospective cohort study among 1,005 consecutive patients who had a young stroke between 1980 and
2010. 501 survivors (170 TIA, 294 ischemic stroke [IS], 37 intracerebral hemorrhage [ICH]) underwent an extensive neuropsychological battery covering the main cognitive domains after a mean follow up of 10.1 years. Age- and sex-matched relatives and friends without a young stroke participated as controls (n=152). Adjustments were made for mood, fatigue, sex, age and education.

Results:
Mean age at young stroke was 50.1 years (SD 10.5), 53.3% were female. IS patients performed worse than controls on measures of speed of information processing (Mean standardized difference between controls and patients z-score=-.6), working memory (z=-.6), immediate memory (z=-.3), delayed memory (z=-.3), attention (z=-.5) and executive functioning (z=-.4) (all p<.0001). ICH patients performed worse than controls on speed of information processing (z=-.8) and memory (z=-.6 to -.8) (all p-values<.0001). TIA patients performed at control level, except for delayed memory (z=-.3, p=.0004). Cognitive decrements (mild: z<-1SD, severe: z<-1.5SD) were found in 45% of all IS patients, 35% of ICH patients and in 25% of TIA patients.

Conclusion:
Our study showed for the first time that decrements in cognitive performance are present more than ten years after a young stroke. FUTURE studies need to investigate the underlying mechanism and effect of quality of life.

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NEUROAID® (MLC 601) in Ischemic Stroke Recovery
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University of Santo Tomas Hospital, Manila, PHILIPPINES

The utilization of traditional medicines has been part of stroke treatment in
Asian countries such as in India and China. Numerous clinical studies regarding the efficacy and safety of NeuroAiD have been published. For several years now, we have had the opportunity to use MLC601 for patients with ischemic stroke. The aim of this study is to present our experience on the efficacy of MLC601 for Ischemic stroke on the recovery from functional disability. This is a retrospective cohort study of patients who were diagnosed with acute ischemic stroke confirmed by cranial CT scan or MRI and received NeuroAiD 4 capsules 3 times a day for a total of 3 months. Age-sex matched controls were selected from our Stroke Data Bank duly approved by the institution for research purposes. Baseline characteristics including age, sex, history of previous stroke, mRS score at baseline, vascular distribution, and vascular risk factors were collected and recorded. The mRS scores at 3 months were obtained by reviewing the patient’s outpatient records and via phone interview. The primary outcome measure was mRS score at 3 months utilizing the “shift analysis” and dichotomizing the mRS to either independent (mRS 0-2) or dependent (mRS 3-6). Secondary outcome measures included the comparison of mRS change from baseline to month 3 as well as the achievement of a functional outcome at month 3 similar to pre-stroke conditions (mRS 0-1).

Results: Patients becoming independent (mRS 0-2) by month 3 were higher in the treatment group as compared to the control group with 21 out of 30 patients or 70% vs. 17 out of 30 patients or 57% in the control group. The proportion of patients who reached an mRS score of 0-1 which is similar to pre-stroke conditions, were significantly seen on patients in the treatment group (16/30 or 53%) compared to the control group (8/30 or 27%). Although both groups demonstrated significant improvements in mRS scores, the mean change in the treatment group was statistically significant.

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Baseline serum thyroid-stimulating hormone levels correlate with long-term functional outcome and mortality in acute ischemic stroke patients

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Background
After acute ischemic stroke, endocrine alterations of the hypothalamic-pituitary axis are early detectable and could therefore be helpful in predicting stroke outcome. We investigated the relation between baseline serum thyroid-stimulating hormone (TSH) levels and stroke severity, functional outcome and mortality.

Methods
Serum TSH levels were obtained in 118 patients within 24 h of acute ischemic stroke, not treated with thrombolysis.
Stroke severity on admission was assessed using the National Institutes of Health Stroke Scale (NIHSS). Outcome was evaluated at 3 months using the modified Rankin Scale (mRS) and all-cause mortality. Patients were divided into a high and a low TSH-level group, with the median TSH level of the whole group as cut-off. The mRS shift between these groups was calculated with the van Elteren-Cochran-Mantel-Haenszel test.

Results

Of the 118 patients, 54.2% were male and the mean age was 72.8 (± 12.3) years. The median NIHSS score on admission was 5 (IQR: 2-13). The median TSH level on admission was 0.94 µg/L. Stroke severity was similar in the groups with low and high TSH levels (median NIHSS score, 8 vs. 10; P=0.16). Patients with lower TSH levels were younger than patients with higher TSH levels (70.0 vs. 75.6 years; P=0.01). Controlling for age, the distribution of the mRS scores was significantly more favorable in the group with low TSH levels, as compared to the high TSH levels (van Elteren-Cochran-Mantel-Haenszel test; P=0.04). After 3 months, a total of 17 patients (14.4%) had deceased, with 6.8% of deaths in the lower TSH level group and 22% in the higher TSH level group (P=0.02).

Conclusion

In patients with acute ischemic stroke, lower TSH levels are correlated with better functional outcome and lower mortality at 3 months, independently of baseline stroke severity.
Background and purposes: Thrombopoietin (TPO) functions as a neuroprotective factor in experimental stroke models and would be one of the potential therapeutic tools for ischemic stroke; however, its role in human ischemic stroke is still unknown. We examined the temporal profile of plasma TPO and its relationship to neurological outcome in patients with ischemic stroke.

Methods: We designed Research for Biomarkers in Ischemic Stroke (REBIOS) to investigate the temporal profile of plasma TPO in patients with ischemic stroke and its relation to clinical outcome.

Results: More patients are treated in stroke units in recent years. Fewer patients were discharged to geriatric or rehabilitation departments, but on the other hand, more have home rehabilitation.

Conclusions: Stroke care has improved in Sweden during the last 10-15 years. It is very likely that the way stroke is treated, and the way preventive drugs are used, may have changed some stroke characteristics, such as age, stroke recurrence, stroke severity and stroke type. This, as well as improvement in care, has resulted in a better outcome. Stroke is a dynamic disease. Its characteristics and prognosis can change over a relatively short time period.
study to find useful blood biomarkers, and 171 patients with ischemic stroke (atherothrombotic (AT) 34, cardioembolic (CE) 49, lacunar (Lac) 45, and unclassified 43) were recruited from the Fukuoka Stroke Registry, a prospective multi-centered study for acute stroke in Japan. Blood samples as well as clinical information were obtained from the patients at 5 points after the stroke onset, day 0 (within 24 hours), 3, 7, 14, and 90. Plasma TPO and other biomarkers were measured by HumanMAP® v 1.6 (Rules-Based Medicine, Inc.). Age and sex -matched healthy subjects were enrolled from the Hisayama study in Japan as the control group (n=171).

Results: Plasma TPO values were higher at day 0 in all the stroke subtypes (AT 2.35 +/- 0.18, CE 2.33 +/- 0.15, Lac 2.25 +/- 0.15 pg/ml at day 0), compared with controls (1.70 +/- 0.07 pg/ml, p<0.001). TPO at day 0 was positively correlated with BDNF (r=0.58; p<0.001) and EGF (r=0.40; p<0.001). TPO remained higher from admission (2.35 +/- 0.09 pg/ml) to three months (2.52 +/- 0.09 pg/ml) in stroke patients, compared with controls (1.70 +/- 0.07 pg/ml, p<0.001). There was no significant difference in TPO values at day 90 between good outcome (modified Rankin Scale 0 to 2) and poor one (2.40 +/- 0.11 pg/ml vs 2.24 +/- 0.18 pg/ml). Conclusions: Plasma TPO increases immediately after onset and remains high at least for 3 months in ischemic stroke, and is correlated with BDNF and EGF. However, it may be uncorrelated with neurological outcome.

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Cause of death after stroke in the Copenhagen Stroke Study. A 10-year follow-up study
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Background: Cause-specific mortality after stroke was studied in the Copenhagen Stroke Study cohort with 10 years follow-up.

Methods: In a well-defined Copenhagen community all patients with stroke (n=988) during 1992-1993 were registered on hospital admission. Evaluation included stroke severity (Scandinavian Stroke Scale), CT and a cardiovascular risk profile. Cause of death within 10 years according to death certificates was grouped into: Stroke, heart/arterial diseases and non-vascular diseases.

Results: Within the 10-year follow-up death was caused by stroke in 310 patients (31%), in 209 patients by heart/arterial disease (21%) and in 289 patients by non-vascular diseases (29%); 180 patients were still alive after 10 years (18%). Stroke was the dominating cause of death in the first year. The absolute first-year risk of death caused by stroke was 20.2% (95%-CI: [17.7%; 22.7%]), for death caused by heart/arterial disease, and non-vascular diseases the overall absolute risk was 5.2% (95%-
Background
There is clear evidence that better quality of care following a stroke is linked to improved patient outcomes.
We present data from the Stroke Improvement National Audit Programme (SINAP) comparing the survival of patients, based on the quality and speed of care they received.
Methods
SINAP is a prospective audit of acute stroke admissions in England and Northern Ireland. Mortality status for all patients was obtained from the Office for National Statistics. Cox proportional hazards modelling was used to analyse whether processes of care received during the first 72hrs of admission and key pathway timings impacted on survival. Analyses were adjusted for age, sex, OCSP stroke classification, consciousness level and need for palliative care.
Results
Between Apr 2010 and Sep 2011, 30,910 patients were admitted with a diagnosis of stroke. Median follow up time was 155 days (range 1-633), and 6959 (22.5%) deaths were recorded. 30 day survival was 86.7%, with 1 year survival of 73.6%.
Patients taking over 24hrs to arrive at hospital had better survival (HR 0.78 [95% CI 0.71-0.85]), reflecting the fact they had less severe stroke. Patients taking over 1hr from arrival to get to either a stroke team (HR 1.15 [95% CI 1.09-1.21]) or a stroke bed (HR 1.24 [95% CI 1.13-1.35]) had poorer survival.
Meeting the predefined standards of care
was associated with longer survival. Seeing a consultant in the first 72hrs (HR 0.64 95% CI 0.59-0.68), receiving adequate nutrition (HR 0.60 95% CI 0.57-0.63) and seeing an Occupational therapist (HR 0.70 95% CI 0.66-0.74) were especially strong predictors. Patients who required catheters or oxygen had poorer prognosis.

Conclusions
Progressing quicker along the care pathway, and receiving applicable standards of care, was associated with significantly improved survival. Hospitals should ensure that their patients receive appropriate care in a timely manner, in order to maximise their survival prospects.

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**Microbleeds as a predictor of intracerebral hemorrhage in patients receiving oral antithrombotic drugs after a TIA or minor ischemic stroke: a prospective cohort study in Western outpatients**

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**Background**
In Asian people with microbleeds the use of antithrombotic medication is associated with an increased risk of intracerebral hemorrhage (ICH). In European people the few studies showed conflicting results.

**Methods**
In a prospective multicenter cohort study of patients with a transient ischemic attack (TIA) or minor ischemic stroke receiving anticoagulants or antiplatelet drugs, magnetic resonance imaging (MRI) including a T2* weighted gradient echo was performed within 3 months after the start of medication. Patients were followed every six months by telephone. The risk of future vascular complications in patients with and without microbleeds at baseline was calculated with Cox regression analysis.

**Results**
We followed 397 patients for a mean of 3.7 (SD 2.5) years. Mean age was 65.3 (SD 12.2) years. There were 164 (41%) men. Fifteen (4%) patients had suffered from amaurosis fugax. MRI was performed within a median of 14 days after the TIA or minor stroke. Forty-seven (12%) patients had one or more microbleeds. During follow up five patients (1%) suffered from a symptomatic ICH. One ICH occurred in a patient with microbleeds at baseline (adjusted hazard ratio (HR) 2.6, 95% CI 0.3-27). The incidence of stroke during follow up was higher in patients with than in patients without microbleeds (adjusted HR 2.3, 95% CI 1.0-5.3). The incidence of ischemic strokes, vascular deaths, non-vascular deaths and deaths of all causes were also higher in patients with microbleeds, but did not reach statistical significance.

Conclusion
In European patients using antithrombotic drugs after a TIA or minor ischemic stroke microbleeds on MRI indicated an increased risk of future stroke, but were not associated with an increased risk of future symptomatic intracerebral haemorrhages.

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Platelet-derived growth factor-AB/BB is associated with lower risk of recurrent vascular events in non-disabled stroke patients
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Background: Platelet-derived growth factor (PDGF) is expressed in white matter infarct/penumbra and microvesSEL endothelial cells of ischemic stroke patients, suggesting its possible role in axon regeneration/glial scar formation and angiogenesis. Plasma PDGF-BB levels are elevated after stroke and the PDGF-BB/angiostatin ratio predicted short-term neurological outcomes. We therefore determined the longer term association of PDGF-AB/BB with outcomes after stroke.

Methods: 311 patients within 6 months after a TIA or non-disabling ischemic stroke (mRS≤3) seen at Singapore General Hospital between 1999 and 2005 were recruited. Sera were taken at a median of 47 days after index event. Formulation on death, recurrent vascular events and dependency was collected at six-monthly follow-ups for up to 5 years. A recurrent vascular event was defined as stroke, peripheral artery disease, intracranial bleed, cardiac ischemia or death from any of the above. Dependency was defined by a modified Rankin Scale score of ≥3. Cox regressions were
performed to determine associations of PDGF-AB/BB with outcomes. PDGF-AB/BB was put into regression models continuously as per SD increase in square-root transformed levels.

Results: Patients (mean age, 60 yr) were mostly male (64%), Chinese (85%), and had posterior circulation or lacunar infarcts (73%). PDGF-AB/BB was associated with a lower risk of recurrent vascular events both in univariate (HR, 0.61; 95% CI, 0.44-0.84) and multivariate analysis (HR, 0.62; 95% CI, 0.46-0.85). PDGF-AB/BB was not associated with death (HR, 0.94; 95% CI, 0.60-1.50) or dependency (HR, 0.79; 95% CI, 0.57-1.08) in univariate analysis.

Conclusions: PDGF-AB/BB was associated with lower risk of recurrent vascular events in non-disabled stroke patients, possibly due to its neuroprotective and angiogenic properties. Hence PDGF-AB/BB may serve as a prognostic marker and potential therapeutic target for stroke.

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Metabolic syndrome Is Associated with Functional Outcome in Patients with Acute Ischemic Stroke
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Backgrounds: Although, numerous studies demonstrated that increased risk for ischemic stroke associated with metabolic syndrome, there is a paucity of information about the role of metabolic syndrome as a predictor after ischemic stroke. We investigated the association between the metabolic syndrome and functional outcome in patients with acute ischemic stroke. Methods: We retrospectively evaluated 691 consecutive patients with acute stroke who were admitted to Seoul National University Hospital between January 2007 and June 2011. We defined the metabolic syndrome as having 3 or more of the following 5 cardiovascular risk factors: 1) central obesity (waist circumference: men ≥ 90 cm, women ≥ 80 cm); 2) elevated triglycerides (≥ 150 mg/dl); 3) diminished high-density lipoprotein (HDL) cholesterol (men < 40 mg/dl; women < 50 mg/dl); 4) systemic hypertension (≥ 130/85 mm Hg); and 5) elevated fasting glucose (≥ 100 mg/dl) using the guideline of revised national cholesterol education program (NCEP). Unfavorable functional outcome using responder analysis, which outcome was adjusted by initial severity of stroke was defined as follows; patient with a discharge mRS score of 1 with admission NIHSS score of 0 to 7, a discharge mRS score of 2 with admission NIHSS score 8 to 14, or a discharge mRS score of ≥ 3 with admission NIHSS score ≥ 15. Multivariable logistic regression analysis was used to evaluate the relationship with the metabolic syndrome and unfavorable functional outcome. Results: Among 691 patients, 277 patients were classified to the unfavorable outcome. The association between metabolic syndrome and unfavorable outcome remained significant after adjustment of possible confounders; adjusted odds ratio (95% confidential interval), 1.57(1.13-2.19).
Blood-brain Barrier Disruption after Endovascular Therapy in Acute Ischemic Stroke: Incidence and Prognosis


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Objective: The aim of this study was to evaluate the incidence, baseline characteristics and clinical prognosis of the Blood-Brain Barrier (BBB) disruption after endovascular therapy in acute ischemic stroke (AIS) patients.

Methods:

Patients were identified from a prospective clinical thrombolysis (either intravenous (IV) or intra-arterial (IA) therapy) registry between April 2007 and October 2011 at Bichat University Hospital. All patients treated with IA therapy underwent nonenhanced CT scan immediately and 24 hours after treatment. BBB disruption was defined as a hyperdense lesion on the post treatment CT scan. Two investigators who were blinded to the follow-up images and clinical data reviewed images by consensus.

Results:

Two hundred twenty patients treated with IA therapy were included. Among them, BBB disruption was found in 128 patients (58%). Cardioembolic etiology, high NIHSS score and blood glucose level at admission, ICA occlusion, and use of combined IA therapy (chemical and mechanical revascularisation) were independently associated with presence of BBB disruption. In comparison to patients without BBB disruption, patients with BBB disruption were associated with a lower rate of early neurological improvement (9% vs. 32%, p<0.001) favorable outcome (40% vs. 62%, p=0.001), and excellent outcome (22% vs. 44%, p<0.001). Conversely, patients with BBB disruption were associated with a higher risk all-cause death (35% vs. 15%, p=0.001) and hemorrhagic complications (42% vs. 9%, p<0.001). In multivariate analysis, BBB disruption remained negatively associated with early neurological improvement (adjusted OR, 0.28; 95%CI, 0.11-0.70) and positively associated with mortality (adjusted OR, 2.37; 95%CI, 1.06-5.32) and hemorrhagic complications (adjusted OR, 6.38; 95%CI, 2.66-15.28).

Conclusions: BBB disruption has a detrimental effect on outcome after endovascular therapy. BBB disruption assessment may play a role in the prognosis staging in these patients.
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Negative impact of elevated admission glucose levels on one-year survival after acute ischemic stroke associated to disease severity.
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Background: Hyperglycemia is present in up to 49% patients with ischemic stroke (IS) and is suggested to be associated with higher short-term mortality. Association of elevated glucose levels with long-term outcome is still unclear. The purpose of this study was to investigate the impact of admission glucose levels on one-year survival rate.

Methods: Consecutive IS patients were retrospectively screened. Plasma glucose levels were measured within 24 hours from the symptom onset. Information on the date of death was obtained in all deceased patients. Time to death was examined with Kaplan-Meier analysis and Cox proportional hazards regression analysis was performed to calculate hazard ratios.

Results: Of 170 IS patients, 112 without a diagnosis of diabetes were included in the final analysis. Admission hyperglycemia was defined as plasma glucose \( \geq 7.8 \text{ mmol/L} \). During a median observation of 15 months (range 0-64), 34 patients (30%) were deceased. The overall 3- and 12-months survival rate was 88% and 84% respectively in non-hyperglycemic IS (n=100) and 83% and 66% in hyperglycemic IS (n=12). Age, gender, blood pressure at admission, vascular comorbidities and biochemical parameters including blood and cholesterol status and renal function did not differ in hyperglycemic vs. non-hyperglycemic patients. Mean NIHSS at admission was 4.3 in non-hyperglycemic IS vs. 9 in hyperglycemic patients (p=0.03). Cox proportional hazard analysis confirmed that age (HR 1.1; 95%CI 1.04-1.16; p=0.001) and admission NIHSS (HR 1.06; 95%CI 1.01-1.11; p=0.01) but not glyceremic status were independent predictors of survival.

Conclusion: Elevated admission glucose levels in acute IS are associated with unfavorable clinical outcome and this may reflect the severity of stroke rather than an effect of hyperglycemia per se.

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N-terminal pro-brain natriuretic peptide and short-term mortality after stroke
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Background: N-terminal pro-brain natriuretic peptide (NT-proBNP) levels are frequently elevated in the setting of acute ischemic stroke. This study investigated whether the baseline NT-proBNP level on admission can predict short-term mortality after ischemic stroke. Methods: 100 patients with acute ischemic stroke underwent a thorough clinical and paraclinical evaluation including serum NT-proBNP measurement. Results: 7% of patients died within a week after the stroke onset. The NT-proBNP levels were significantly higher among the patients who died than among the survivors (p=0.002). The optimal NT-proBNP cutoff point for predicting mortality was 1330 pg/ml, with a sensitivity of 100% and a specificity of 70%. Multivariate analysis demonstrated that NT-proBNP concentration was an independent predictor of short-term post-stroke mortality (p=0.027). Conclusions: An increased NT-proBNP level was significantly and independently correlated with short-term mortality in patients after ischemic stroke.

Key words: Mortality • N-terminal pro-brain natriuretic peptide • Stroke

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Plasma levels of the anticoagulant activated protein C in acute stroke are related to long term mortality at 2 years

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Background: Activated protein C (APC) inhibits coagulation and resistance to APC have been shown to directly relate to arterial thrombosis. In addition, APC has anti-inflammatory and neuroprotective properties. APC has been shown to be reduced in ischemic stroke but it is unclear whether APC relates to mortality after stroke.

Methods: 82 people were recruited within 3 days of having an ischemic stroke. Mortality data were collected for 2 years. Severity of stroke was assessed at baseline using Barthel Index (BI) and dichotomised into moderate-severe strokes (BI<15) vs. mild strokes (BI>=15). In-
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Blood gene expression profiling to predict ischemic stroke outcome
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Background: Nowadays clinicians have no accurate tools to predict stroke outcome beside clinical and neuroimaging data. Gene expression profiling techniques offer the opportunity to discover new markers that might add information to stroke prognosis. Our aim was to study gene expression changes associated to neurological outcome of stroke, using a blood-samples pooling strategy to reduce biological variability.

Methods: Total RNA from blood obtained <4.5h from stroke onset of 44 tPA-treated stroke patients were equally pooled within outcome groups (based on NIHSS score differences during in-hospital stay): worsening (WOR, n=4 pools), stability (STA, n=6 pools) and improvement (IMP, n=6 pools). These 16 pools were processed using Affymetrix GeneChip Human Exon 1.0 ST array. Statistical comparisons were made between pairs (WOR vs. STA, WOR vs. IMP and IMP vs. STA) using age and NIHSS at baseline as covariates. Differentially expressed genes were selected by linear model analysis. Spearman correlations between gene expression and NIHSS 38 genes showed a coefficient >0.5 and a p-value <0.05. IPA analysis revealed gene interactions in cell death,
Background: We aimed to determine the association between blood pressure (BP) variability and cognitive outcomes in patients with acute lacunar infarction. Methods: Included were patients with acute lacunar infarction who completed a comprehensive cognitive evaluation 3 months later: the Korean-Mini Mental State Examination (K-MMSE), Seoul Verbal Learning Test, Rey Complex Figure Test, Trail Making Tests A and B (TMT-A, TMT-B), Controlled Oral Word Association Test, Korean-Boston Naming Test (K-BNT), and Digit Symbol Coding (DSC). We excluded patients with previous functional disability or dementia. Standard deviation (SD) and coefficient of variance (CV) were used as BP variability parameters, calculated from all BP data between the third and sixth days after onset. Z-scores for each cognitive function test were used as cognitive outcome parameters. Linear regression analysis was performed to assess the relationship between cognitive outcomes and BP variability, adjusted for age and educational level and for variables (eg, sex, vascular risk factors, initial National Institutes of Health Stroke Scale [NIHSS] score, and mean BP values) with a p value < 0.1 by bivariate analysis.
Results: The study consisted of 24 patients (15 men; mean age 61.8 y). In bivariate analysis, high BP variability values were correlated with low z-scores for K-MMSE, TMT-A, TMT-B, K-BNT, and DSC, but not with other tests for cognitive function. In the linear regression analysis, some BP variability parameters were inversely correlated with z-scores for K-MMSE, TMT-B, K-BNT, and DSC and were consistently associated with TMT-B. High SDs of systolic and diastolic BP values were significant predictors of low TMT-B z-scores (p=0.039 and p=0.037, respectively).

Conclusion: High BP variability during admission in acute lacunar infarction may be a predictor of poor cognitive outcomes after 3 months, especially frontal lobe dysfunction. Further large scale studies are needed.

CHEMOKINES ROLE IN THE NEUROVASCULAR UNIT AND IN THE BLOOD AFTER HUMAN ISCHEMIC STROKE
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Background: Chemokines act mainly guiding leukocyte migration along the endothelium. Together with other pleiotropic effects, such as angiogenesis or neuronal survival, chemokines have a role in both damage and repair in brain tissue after ischemic stroke. Our aim was to study the presence of chemokines directly in brain tissue and also in blood samples of stroke patients and to evaluate their relationship with the prognosis of the disease.

Methods: By means of laser microdissection (LMD6000, Leica), we obtained about 6,000 neurons or blood vessels from both the infarcted and the healthy contralateral brain areas of 4 patients who died following an ischemic stroke. Using multiple ELISA Searchlight® array we evaluated 9 chemokines (MIP-1a, MIP-1b, MCP-1, RANTES, I-309, TARC, Eotaxin, MDC, IL-8) in those microdissected samples. The same ELISA assay was performed in plasma samples from 22 stroke patients, whose blood was drawn at admission, 1st, 3rd and 7th day and 3rd month after the event. The results were associated with the neurological and functional condition of the patients (by NIHSS and mRS scores, respectively) using SPSS 15.0 software.

Results: Among 9 studied chemokines, MCP-1, Eotaxin and I-309 were found highly expressed in neurons than in blood vessels (p=0.009, p=0.036 and p=0.046, respectively), without differences between infarcted and contralateral areas. Interestingly, MDC was decreased within the neurons of the infarcted tissue (p=0.057); and in plasma MDC level decreased during the acute phase (p=0.001) and showed a peak at 7th day after the event (p=0.033). High plasma levels of MDC and MCP-1 within the first three days after ischemic stroke were associated with good outcome in the subacute
Glomerular filtration rate (GFR) calculated using the MDRD equation was used as a marker of renal function and categorized in 3 groups (≥ 60, 30-59 and < 30 mL/min/1.73m²). The combined outcome of interest was death or neurological deterioration defined as an increase of 4 or more points in the National Institute of Health Stroke Scale (NIHSS). Independent predictors of the outcome were identified using logistic regression. Values of p<0.05 were considered statistically significant.

Results: 385 patients were included (mean age 68 years, 53% male). Patients with a GFR < 60 mL/min/1.73m2 were older (75 vs 66 years), more hypertensive (76% vs 59%), more dyslipidemic (55% vs 38%) and showed a higher prevalence of coronary heart disease (25% vs 9%) and heart failure (22% vs 7%) as well as a higher baseline NIHSS score (8 vs 6). There were no differences in the administration of thrombolytic treatment but the combined outcome was more common in these patients (16% vs 5%). On univariate analysis age (Exp(B)=1.037), thrombolysis (Exp(B)=3.362), temperature (Exp(B)=2.386), NIHSS score (Exp(B)=1.105), serum glucose (Exp(B)=1.007), GFR 30-59 (Exp(B)=2.866) and GFR<30 (Exp(B)=7.457) were associated with the outcome, whereas serum cholesterol showed a protective effect (Exp(B)=0.989). On multivariate analysis, a GFR<30 was an independent predictor of the outcome (Exp(B)=9.829), as was thrombolysis (Exp(B)=3.277) and serum glucose (Exp(B)=1.009).

Conclusion: A GFR<30 mL/min/1.73m2 is an independent predictor of death or
neurological deterioration in the acute phase of ischemic stroke.

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**The Impact of CHADS2 Score and Atrial Fibrillation on Early Stroke Morbidity and Mortality**

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Virtual International Stroke Trials Archive Collaborators

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**BACKGROUND:** The CHADS2 (Congestive heart failure, Hypertension, Age ≥ 75, Diabetes and Stroke) score is a validated predictor of stroke risk in atrial fibrillation (AF). Both the CHADS2 score and AF are associated with increased long-term mortality following stroke. We aimed to determine the independent effect of the CHADS2 score and AF on early stroke outcomes.

**METHODS:** We searched the Virtual International Stroke Trials Archive (VISTA) for imaging confirmed ischemic stroke patients with complete documentation of the CHADS2 variables, AF, baseline National Institutes of Health Stroke Scale (NIHSS) score, intravenous tissue plasminogen activator (tPA) treatment, and 3-month modified Rankin Scale (mRS) score. Patients who received either placebo or non-effective active treatments were included. Multivariable analysis was used to determine the independent effect of CHADS2 score and AF on poor functional outcome (mRS3-6) and mortality 3 months after stroke.

**RESULTS:** A total of 6,767 patients met the selection criteria, of whom 1,800 (27%) had AF. At baseline, AF patients were older (median 76 vs. 70 years, p<0.001), had higher CHADS2 (mean 2.3 vs. 1.9, p<0.001) and NIHSS (median 15 vs. 12, p<0.001) scores. At 3 months, more AF patients had poor functional outcomes (70 vs. 55%, p<0.001) or were deceased (21 vs. 14%, p<0.001). After adjusting for baseline differences in age, gender, NIHSS score and tPA use, the CHADS2 score but not AF remained independently associated with early mortality (CHADS2 OR 1.12, 95% CI 1.06-1.18; AF OR 1.14, 95% CI 0.98-1.33) and poor functional outcome (CHADS2 OR 1.16, 95% CI 1.10-1.22; AF OR 0.99, 95% CI 0.86-1.14).

**CONCLUSION:** The CHADS2 score appears to be an easy-to-calculate predictor of early outcomes for all ischemic stroke.
patients, in addition to age and baseline stroke severity. AF is not independently associated with early stroke outcomes after adjusting for other baseline imbalances and the CHADS2 score.

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Outcome prediction in intracerebral hemorrhage by the treating neurointensivist is more accurate than prediction based on prediction models.

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Background: Accurate prognostication of patients with a spontaneous intracerebral hemorrhage (ICH) is critical, because physician perception of future quality of life affects aggressiveness of care and patient outcome. ICH prediction models help stratify patients according to their risk of a good or poor outcome. We compared the accuracy of neurointensivists’ outcome prediction to outcome prediction by the ICH score. Methods: Adult spontaneous ICH patients with the following criteria were prospectively enrolled: GCS >5; signed informed consent; and absence of a severe coexisting or terminal illness. The treating neurointensivist predicted the 3-month modified Rankin scale score (mRS) typically within 2 days of hospital admission. None of the neurointensivists used the ICH score routinely to help predict outcome.

Patient outcomes were determined by clinic visits or by standardized telephone interviews, and dichotomized to good (mRS 0-3) and poor (mRS 4-6). Neurointensivists’ predictions were compared to the ICH score using actual 3 month outcome as the reference. Results: Of 116 prospectively enrolled patients 101 were included: 2 withdrew consent and 13 were lost to follow-up. Neurointensivists’ overall accuracy was 79%, which was higher than the accuracy of the ICH score at a cut-off of >1 (67%; p=0.06) or >2 (58%; p=0.001). At a cut-off >1, the sensitivity for poor outcome prediction did not differ, but the neurointensivists’ specificity for poor outcome was greater (92% vs. 66%; p<0.001). Conversely, at an ICH score cut-off >2 the specificity for poor outcome prediction did not differ, but the neurointensivists’ sensitivity for poor outcome was greater (67% vs. 25%; p<0.001). The results were similar if instead of the original ICH score a modified ICH score was used as the comparison that had been developed on the same patient cohort. Conclusions: Neurointensivists at our institution predict ICH outcome overall with 79% accuracy. Generally, predictions for poor outcome are more accurate than those for good outcome. Outcome predictions for the individual patient by the treating neurointensivist are more accurate than those based on ICH prediction models.
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Selecting patients with acute ICA occlusion for carotid endarterectomy
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Background
Outcome in patients with acute ischemic stroke from internal carotid artery (ICA) occlusion is quite heterogeneous. Carotid endarterectomy (CEA) within 6 hours of symptoms onset has been suggested as a reasonable therapeutic option. However, criteria to select patients for early CEA have not been evaluated. We aimed to study hemodynamic findings and duplex threshold values enabling very early prediction of the spontaneous clinical course to select patients who might benefit from early CEA.

Methods
From 1996 to 2011, 438 consecutive patients presented at our vascular and stroke center with an acute anterior circulation ischemia, in whom duplex sonography/CTA/MRA demonstrated ipsilateral ICA occlusion. All patients underwent serial brain CT/MRT. The neurological deficit was quantified according to the NIHSS score, functional outcome was evaluated with the modified Rankin Scale (mRS) at 90 days.

Results
Mean age was 64.4 years (SD 13.7), median NIHSS score was 14. In 337 (77%) patients functional outcome after 3 months could be surveyed. 99 (29%) patients were independent (mRS 0 to 2), 176 (52%) had a disabling deficit (mRS 3 to 5), 62 (18%) had died. Middle cerebral artery mean flow velocity of at least 40 cm/s within 24 hours of symptoms onset was associated with a favorable outcome (mRS 0 to 2) compared to flow velocities below 40 cm/s (OR 5.1, p < 0.001). A mean flow velocity of less than 40 cm/s predicted a worse outcome even in patients with minor neurological deficit (NIHSS score 0 to 6) within 24 hour of symptoms onset was associated with a favorable outcome (mRS 0 to 2) compared to flow velocities below 40 cm/s (OR 5.1, p < 0.001). A mean flow velocity of less than 40 cm/s predicted a worse outcome even in patients with minor neurological deficit (NIHSS score 0 to 6) within 24 hour of symptoms onset was associated with a favorable outcome (mRS 0 to 2) compared to flow velocities below 40 cm/s (OR 5.1, p < 0.001). A mean flow velocity of less than 40 cm/s predicted a worse outcome even in patients with minor neurological deficit (NIHSS score 0 to 6) within 24 hour of symptoms onset was associated with a favorable outcome (mRS 0 to 2) compared to flow velocities below 40 cm/s (OR 5.1, p < 0.001). A mean flow velocity of less than 40 cm/s predicted a worse outcome even in patients with minor neurological deficit (NIHSS score 0 to 6) within 24 hour of symptoms onset was associated with a favorable outcome (mRS 0 to 2) compared to flow velocities below 40 cm/s (OR 5.1, p < 0.001). A mean flow velocity of less than 40 cm/s predicted a worse outcome even in patients with minor neurological deficit (NIHSS score 0 to 6) within 24 hour of symptoms onset was associated with a favorable outcome (mRS 0 to 2) compared to flow velocities below 40 cm/s (OR 5.1, p < 0.001).
Outcome predictors of stroke patients in the need of intensive care treatment
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Background. The prognosis of stroke patients admitted to intensive care units (ICU) is commonly regarded to be poor. However, only limited data regarding outcome predictors are available.

Patients and Methods. Out of 4414 consecutive patients admitted to our stroke unit with the diagnosis of acute stroke, we analyzed 347/4414 (164 m, mean age 70.8 y) needing ICU management. Ischemic stroke was diagnosed in 252/347 (72.6%), intracerebral hemorrhage occurred in 95/347 (27.4%). Median NIHSS score at admission was 13 (range 0-33). The most common reasons for ICU treatment were stroke-related disturbances of consciousness with reduced brain stem reflexes (47.1%), cardiac (23.4%) and respiratory (12.1%) complications or interventional procedures requiring mechanical ventilation (11%). 143/347 (41.2%) were mechanically ventilated (mean 84h).

Results. In-hospital mortality (143/347; 41.2%) was associated with old age, poor NIHSS score at admission, hemorrhagic stroke and mechanical ventilation (p<.001 in all). Further, admission to ICU because of stroke-related impairment of consciousness was related to in-hospital mortality (p<.001). Patients with atrial fibrillation (AF) were more likely to develop cardiac complications (p<.001) and to die from non-neurological reasons (p=.044); overall in-hospital mortality, however, was not increased in patients with AF (p=.225). Cardiac and respiratory complications, infection and resuscitation were associated with in-hospital mortality of non-neurological etiology (p<.001). In contrast, patients who experienced neurological complications like recurrent stroke, secondary hemorrhage, brain edema or epileptic seizures were more likely to die as a consequence to the neurological disease (p<.001).

Conclusion. The prognosis of stroke patients needing ICU treatment cannot be generalized. Identifying factors for increased in-hospital mortality, e.g. severe hemorrhagic stroke, may help to predict the outcome on a more individual basis.

FACTORS RELATED TO QUALITY OF LIFE IN STROKE PATIENTS.
Comprehensive Stroke Unit. Section of Neurology. Hospital San Pedro de Alcántara, Cáceres, SPAIN

Background: Quality of life (QoL) is a basic measure to assess the impact of disease on individual subject. Stroke is an acute and serious condition that may
result in motor, cognitive and psycho-pathological disturbances. These disor-ders, associated with personal and social circumstances, determine the QoL. We intend to study the influence of several factors on Health-Related QoL of pa-tients after a stroke.

Methods: In a prospective observational study we included patients admitted for stroke assessed at discharge and 24 weeks after the acute event. We used SF-12 scale for assessment of QoL. Past medical history and sociodemographic data were recorded. To evaluate psycho-pathological, neurological and functional status, the Hamilton, NIHSS, Rankin, Barthel and Lawton-Brody scales were used. Valid predictive models were ob-tained for individual indices and mental and physical components of SF-12 scale using linear regression models.

Results: N = 67. Mean age 71.3 years (SD 12.8). 62.9% males. We observed a significant deterioration in physical roles, general health, vitality and social function from baseline and six months post-stroke. In the predictive models we detected that a high score on Rankin and Hamilton were predictors of a worse QoL in the mental aspect. Older age and lower score on the Barthel index predicted a worse score in physical appearance.

Conclusions: Our study suggests that psychological disorders, age and func-tional status are the determinants of QoL after suffering a stroke.

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A SIMPLE SCORE TO PREDICT IN-HOSPITAL MORTALITY AND LENGTH OF STAY AFTER STROKE

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Background: Determinants of risk of extracranial vascular events (EVE) after transient ischemic attack (TIA) are not well defined. The aim of our study was to determine the risk and risk factors for EVE (coronary heart disease [CHD] and peripheral arterial disease [PAD]) after TIA.

Methods: We prospectively recruited pa-tients within 24 hours of transient isch-
21. European Stroke Conference

Stroke prognosis

“CHOLESTEROL LEVELS AND RISK OF HEMORRHAGIC TRANSFORMATION AFTER ACUTE ISCHEMIC STROKE”

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BACKGROUND

Low Cholesterol level is known to be associated with increased cerebral hemorrhage. However the association between cholesterol levels and hemorrhagic transformation (HT) is still controversial. The aim of this study was to evaluate the relationship between cholesterol levels and HT.

METHODS:

We retrospectively studied with 460 patients with ischemic stroke. Demographic and clinical symptoms, vascular risk factors and etiological work-ups were prospectively recorded and established prognostic scores (CHADS2, CHADS2-VASC2, ABCD2, ABCD3I, California risk score, Essen Stroke risk score, Stroke Prognosis Instrument were calculated. Results: 31 (5.9%) EVE (22 CHD and 9 PAD) and 63 (11.9%) recurrent strokes occurred during a median follow-up period of 30 months. Discrimination for the prognostic scores only ranged from 0.60 to 0.70. The incidence of EVE did not varied among the different etiological subtypes. In Cox proportional hazards multivariate analyses we identify alcoholism (Hazard Ratio [HR] 3.66, 1.10-12.13, p=0.034), hypercholesterolemia (HCL) (HR 3.77, 1.84-7.72, p<0.001), motor weakness (HR 1.73, 1.20-2.50) and the presence of carotid plaques (HR 1.29, 1.07-1.56, p=0.007) as independent predictor of EVE.

Conclusion: According to our results, discrimination was poor for all previous risk prediction models. Variables like alcoholism, HCL, motor weakness and carotid plaques should be considered in new prediction models.
the highest ones.

CONCLUSIONS:
Low levels of TC and LDLC are probably associated with greater risk of HT after acute ischemic stroke.

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Survival and prognosis in a cohort of 41 patients with lateral-medullar ischemic stroke.
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CHEDV, Santa Maria da Feira, PORTUGAL

Background: The few survival studies of patients with lateral-medullar ischemic stroke (LMS) show conflicting results. Furthermore, dysphagia is a common and disabling symptom in LMS patients, but the time to recovery is not well known. The aims of this study are to describe survival, causes of death, long-term disability and recovery from dysphagia in a cohort of 41 patients with LMS. Methods: We identified 41 patients with LMS (MRI confirmed) admitted to our hospital from 2000 to 2010. Baseline clinical data was retrieved from a hospital based prospective stroke registry and clinical records. A follow-up questionnaire on new vascular events, survival, and current disability was applied to patients or relatives. Kaplan-Meier curves were used for survival and for time to recover from dysphagia. Results: The median age was 62.3 years, 73% were men. During a mean follow up time of 6.21 years, 11 patients died. The mortality was highest in the early months after the stroke. At the end of the first year the mortality was 17.8%, the main causes of death being pulmonary infection and cardiac arrest. The overall survival after five years was 69.2%. Dysphagia was present in 71.3% of patients at discharge but in only 9.2% one year after stroke, with a median recovery time of 65 days. A modified Rankin scale value of ≤2 was present in 34% of patients at discharge, rising to 84% at follow-up. Conclusion: The mortality in this cohort of LMS patients was especially high in the first months and declined after that. Dysphagia persisted for more than two months in most of the patients, but few remained with dysphagia after one year. The patients who survived had a good functional outcome.

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Association between IGFBP-3 levels and functional outcome in first ischemic stroke patients
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Background and Purpose: Altered pituitary function is a common finding following ischemic stroke. We sought to determine if serum concentrations of IGF-I, and IGFBP-3 are indicative of functional outcome 1 year after ischemic stroke. Methods: In this “Cream&Sugar” (NCT 01378468) substudy, we assessed
plasma levels of LH, FSH, testosterone, IGF-I, IGFBP-3, TSH, fT4 and cortisol three to seven days after first acute ischemic stroke. Stroke severity was assessed using the National Institute of Health Stroke Scale (NIHSS) and modified Rankin Scale (mRS). Functional outcome was assessed after 1 year via a telephone follow-up interview using the mRS. Good functional outcome was defined as mRS 0-2. Age was dichotomized as above or below median age; impaired glucose tolerance was defined as known diabetes mellitus or high blood glucose levels (fasting or in the 2 hour value of an oral glucose tolerance test, according to WHO cut off points); low IGFBP3 levels were defined as lower than the 5% percentile according to Blum et al. 1990. Parameters that showed significant association with poor outcome (mRS \(\leq 3\)) in the follow up were included in a binary logistic regression analysis. Results: A total of 100 consecutive (36% female, median age: 66 yrs, IQR54-74) first acute ischemic stroke patients were included. Median NIHSS was 1 (IQR0-3); median initial mRS was 1 (IQR1-1.75) and 84 patients (84%) had a good functional outcome (median follow-up mRS 1, IQR0-2). Associations were observed between poor outcome and (1) age (OR 3.58, 95% CI: 1.24 – 10.29, p= 0.024), (2) impaired glucose tolerance (OR 2.9, 95%CI: 1.03 – 8.16, p=0.05) and (3) low IGFBP-3 values (OR 22.5, 95%CI: 2.45 – 205.99, p=.002). A binary logistic regression analysis showed that only low IGFBP-3 levels were independently associated with poor outcome (OR 22.5, 95%CI: 2.46 – 205.99, p = 0.006). Conclusion: Low IGFBP-3 levels are independently associated with poor functional outcome after ischemic stroke.

Stroke prognosis

Trombectomy using TEVO device in acute ischemic stroke: single center experience with 60 patients

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BACKGROUND: We sought to explore the safety and efficacy of the new TREVO stent like retriever in consecutive patients with acute stroke.

METHODS: Prospective, single-center study of patients (n=60, mean age 71.3 years, 47% males) with stroke lasting < 8 hours in the anterior circulation (n=54), or < 12 hours in the vertebrobasilar circulation (n=6) were treated if CT perfusion/CT angiography confirmed a large artery occlusion, ruled out a malignant
Introduction. There are two approaches to the problem of stroke prevention: mass strategy and high-risk strategy. High-risk strategy identifies patients with the risk of acute stroke emergence and provides for the designation of appropriate treatment for them. However, for its effective implementation it is necessary to assess objectively the risk of stroke. It’s possible by using mathematical modeling of disease.

Materials and Methods. At the Department of Nervous Diseases the Expert System of Stroke Prognosis (EXSPIN) was developed. In order to determine the accuracy of the EXSPIN a retrospective study was done. We examined patients with various types of stroke in the acute period. In 254 out of 349 patients - cerebral infarction (CI), in 67 - intracerebral hemorrhage (IH), in 28 – subarachnoid hemorrhage (SH) was diagnosed. The average age of patients was 68.3±5.2 years. The diagnosis of stroke and its type is verified by computerized tomography of the brain, lumbar puncture. The prognosis was carried out on 15, 25 and 52 risk factors (RF) (table 1).

Table 1. The results of stroke prognosis by using EXSPIN

<table>
<thead>
<tr>
<th>RG – risk group</th>
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<tbody>
<tr>
<td>15 RF</td>
</tr>
<tr>
<td>25 RF</td>
</tr>
<tr>
<td>52 RF</td>
</tr>
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</table>

Results. The accuracy of prognosis concerning people with CI turned to be higher than the results of people with IH and SH. The number of patients whose type of stroke was identified correctly during the prognosis is: on 15 RF - 73%, on 25 RF - 81%, on 52 RF - 86%. Prognosis accuracy was increasing with the age of patients and got its highest point.
Table 1. The results of stroke prognosis by using EXSPIN

<table>
<thead>
<tr>
<th>Type of stroke</th>
<th>15 (RF)</th>
<th>25 (RF)</th>
<th>52 (RF)</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Included in RG*, %</td>
<td>Not included in RG, %</td>
<td>Included in RG, %</td>
</tr>
<tr>
<td>CI (n=254)</td>
<td>87.0</td>
<td>13.0</td>
<td>90.2</td>
</tr>
<tr>
<td>IH (n=67)</td>
<td>55.2</td>
<td>44.8</td>
<td>70.1</td>
</tr>
<tr>
<td>SH (n=28)</td>
<td>46.4</td>
<td>53.6</td>
<td>57.1</td>
</tr>
</tbody>
</table>

* RG – risk group

Table 2. The accuracy of stroke prognosis in different age groups

<table>
<thead>
<tr>
<th>Age</th>
<th>Number of RF</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>15</td>
</tr>
<tr>
<td>Up to 44 years</td>
<td>70.4%</td>
</tr>
<tr>
<td>45–59 years</td>
<td>77.9%</td>
</tr>
<tr>
<td>60–74 years</td>
<td>83.4%</td>
</tr>
<tr>
<td>Older than 74 years</td>
<td>91.6%</td>
</tr>
</tbody>
</table>

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IN-HOSPITAL MORTALITY AFTER ACUTE STROKE: PREDICTIVE FACTORS

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Background:
Mortality after acute ischemic stroke is decreasing. However, little is known about the sociodemographic, clinical and hospital factors associated with in-hospital death.

Methods:
In a 2-year period, 670 consecutive patients with ischemic stroke were included in our stroke register (TIA and hemorrhagic stroke were excluded). We estimated the independent attributable risk for death of different variables, and performed a multivariate analysis to establish the best predicting models. Parametric analysis was employed for continuous variables; when the exposure factor was categorical (gender, risk factors, etc.), Chi-square or Fisher’s exact test were used. Finally, a multivariate logistic regression analysis was performed. Effects were deemed significant if \( p<0.05 \). Statistical analysis was carried out using SAS System, version 9.2 (SAS Institute, Inc., Carey, NC).

Results:
The overall in-hospital mortality was 7%. The median length of stay was 7 days.

Age, history of atrial fibrillation, stroke severity (NIHSS) and recurrence were the nonmodifiable variables linked to...
the highest odds of in-hospital mortality. Cardioembolic stroke (TOAST classification) and TACI (OCSP) conveyed the poorest outcomes. Among the modifiable variables, respiratory infection and cardiovascular events were responsible for the highest attributable proportion of deaths in this stroke population. In contrast, urinary infections and seizures were not associated with higher mortality.

Conclusion:
Acute stroke care should include models for prediction of in-hospital mortality focused on identifying patients with high risk of short-term mortality.
Intensive efforts need to be made to reduce early complications, especially respiratory infections that would result in further decreasing the mortality in ischemic stroke patients.

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INTRAVENOUS THROMBOLYSIS IN YOUNG PATIENTS WITH STROKE. INFLUENCE OF ETIOLOGICAL SUBTYPE ON STROKE OUTCOME.

Background: There is a different distribution of ischemic stroke (IS) etiologies between young and elderly patients, and some etiologies are characteristic of young patients. Our aim was to analyze IS outcome after intravenous thrombolysis (IVT) in IS young patients (<55 years) according to etiological subtype.

Methods: Case-control study, inclusion of consecutive IS patients. Functional outcome [modified Rankin Scale (mRS)] at 3 months was compared in IVT treated (cases) and untreated patients (controls) according etiological subtype, including specific analysis for patent foramen ovale (PFO), cervical arterial dissection (CAD), and coagulopathies. To adjust outcome by stroke severity a further analysis matching patients according to NIHSS was developed. Finally, we analyzed the differences in outcome in IS young patients IVT-treated as compared with IS patients ≥55 years IVT-treated within the same period. Results: 168 IS patients aged <55 years (36 IVT-treated) and 194 ≥55 years IVT-treated were included. IVT-treated young patients showed more stroke severity (NIHSS median 6 vs 2) and a trend to better outcome in all the etiologies. There were no significant differences between IVT-treated and untreated patients with PFO, CAD and coagulopathies, although a trend to better outcome in IVT-treated patients with hypercoagulable state was found [mRS ≥3: 0 vs 14.3%]. Patients aged ≥55 years had worse outcome in most of stroke etiological subtypes, except for unusual stroke [mRS≥3: 12.5% vs 17.6%; p=0.57]. Conclusion: Young IS patients (<55 years) IVT-treated have better outcome at 3 months than those non IVT-treated without differences among etiological subtypes. Patients aged ≥55 years IVT-treated showed worse outcome in most etiological
subtypes of stroke, except for unusual stroke.

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Cognitive measures as an adjunct to modified Rankin scale for outcome assessment after acute stroke

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Introduction: Cognitive impairment receives less attention than motor deficit on the modified Rankin Scale (mRS). A “cognitive” extract of the National Institutes of Health Stroke Scale (Cog-4) correlates with mRS, but it is not known if Cog-4 adds value. We investigated responsiveness of Cog-4 to treatment with thrombolysis in ischaemic stroke patients (IS) and tested if it offers information that supplements mRS. We also hypothesised that Cog-4 deficits may resolve more readily in haemorrhagic stroke (ICH) than IS.

Methods: We included 7,444 IS (43% received iv thrombolysis) and 793 ICH patients from the Virtual International Stroke Trials Archive. We compared day 90 outcomes of thrombolysed (IS-T) versus untreated IS (IS-U), and of IS versus ICH patients, by mRS (illustrative) and by Cog-4 (primary measure) adjusting for baseline clinical factors (age, hemispheric lateralisation, baseline stroke severity, baseline cognitive impairment). Analysis of Cog-4 was repeated within strata of 90 day mRS. We used proportional odds logistic regression and Cochran-Mantel-Haenszel test.

Results: Baseline factors favoured IS-U but mRS outcomes favoured IS-T after adjustment (OR 1.56; 95% CI 1.43-1.72; P<.001). Adjusted Cog-4 scores at 90 days were better in IS-T compared to IS-U (OR 1.31; 95% CI 1.18-1.47; P=0.006). However, Cog-4 analysis stratified by 90 day mRS was neutral for IS-T versus IS-U (OR 1.01; 95% CI 0.90-1.14).

Between IS and ICH, baseline stroke severity and mortality favoured IS but mean baseline Cog-4 favoured ICH. MRS was worse in ICH irrespective of survival (OR 0.58; 95% CI 0.50-0.64, P<.001), but Cog-4 distribution favoured ICH (OR 1.45, 95% CI 1.21-1.73, P<.001 for non-stratified analysis; OR 2.10, 95% CI 1.74 – 2.53, P<.001 for analysis stratified by mRS).

Conclusions: Cog-4 may be responsive to treatment but does not provide additional information beyond mRS in IS. ICH patients show better Cog-4 outcome despite poorer prognosis and mRS.

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Long-term follow-up of young ischemic stroke patients and controls: the western Norway experience
plexsonography at follow-up showed a total maximum intima-media-thickness <1.0mm for 24% of the patients (3).

Memory problems were reported by 41% patients vs. 5.4% controls. Bloodpressure 140/90mmHg was measured in 61% of the patients, 38% were still active smokers and 38% used a statin. Conclusion: Rates of mortality, arterial events, subclinical carotid artery changes and memory problems are high in patients who suffered ischemic stroke at a young age. Therapeutic intervention was inadequate. These results are the basis for NOR-SYS (Norwegian Stroke in the Young Study), a prospective study over 20 years that includes standardized questionnaires and ultrasound examinations for identification of risk factors and subclinical arterial disease, aiming at more aggressive treatment of modifiable risk factors.

References:
ship between recurrence rate of symptomatic seizures in postischemic stroke patients receiving antiplatelet / anticoagulant therapy.

Method: We reviewed the clinical findings and laboratory data of 212 patients with postischemic stroke symptomatic seizures, hospitalized in our neurological service for primary diagnoses between 2007 – 2010 and 1 year follow-up in outpatient’s service. All patient, aged 35 – 75, were investigated by clinical examination, brain computed tomography, vascular related blood tests, EEG studies, cerebrovascular ultrasound and transthoracic echography searching possible new sources of emboli for every new seizure. All received first line antiepileptic drugs and 104 patients received antiplatelet / anticoagulant treatment.

Results: We find 46 (22 %) patients with early-onset seizures and 166 (78%) late-onset seizures patients. Regarding the topography and types of infarcts 98 (47%) supratentorial infarcts, 28 (13%) watershed 48 (22%) with subcortical involvement, 24 (11%) lacunars strokes, 14 (7%) TIA. 38 (18%) patients with recurrent stroke. Seizure type: 72 (34%) generalized tonico clonic, 62 (29 %) simple partial seizures, 78 (37%) partial seizures with secondary generalization. Only 38 (18%) patients with recurrent stroke.

22 (3 vs. 8) patients with early-onset seizures, 82 (30 vs. 52) late-onset seizures patients, 32 (10 vs. 21) simple partial seizures, 72 (22 vs. 40) patients with primary and secondary generalized tonico clonic seizures received antiplatelet / anticoagulant treatment with lower rate of seizure recurrence.

Conclusion: Rate of seizures recurrence was lower in groups with antiplatelet treatment, may be due to lower rate of recurrent small silent infarcts.

Key words: seizure, stroke, anplatelet therapy.

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CYP2C19 variants do not associated with clinical efficacy of clopidogrel in Korean stroke survivors

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BACKGROUND: CYP2C19 variants may influence platelet inhibitory activity of clopidogrel and cause higher risk of cardiovascular events. However, the effect of CYP2C19 genotypes on clinical outcomes in patients with ischemic stroke remains controversial. We studied whether CYP2C19 variants influence clopidogrel efficacy in Korean stroke survivors.
METHODS; Genotyping of CYP2C19 alleles (*1, *2, or *3) and measurement of platelet activity using VerifyNow P2Y12 were done in 98 ischemic stroke patients with taking clopidogrel. We then examined the relation of the CYP2C19 loss-of-function alleles (*2 or *3) to the anti-platelet activity and cardiovascular outcomes (ischemic stroke, myocardial infarction, or unstable angina) during 5-year of follow-up. RESULTS; Of 98 patients, 42.3% were non-carriers, 39.8 % had 1 CYP2C19 loss-of-function allele, and 17.3% had 2 CYP2C19 loss-of-function alleles. The rates of inhibition of platelet activity by clopidogrel were 25.1±18.2 % in carriers with CYP2C19*2, 22.3±19.0 % in carriers with CYP2C19*3, and 41.6±19.4 % in non-carriers.Twenty patients(20%)experienced the compositesclinical outcomes of ischemic stroke, myocardial infarction or unstable angina during 5-year of follow-up.No significant association was found between the clinical outcomes and carriers of CYP2C19*2 (HR, 1.11; 95% CI, 0.44-2.76; P=0.828) orCYP2C19*3 (HR, 1.35;95% CI, 0.41-4.50; P=0.624).Similarly, the risk of the clinical outcomes was not significantly different between patients with any two of the CYP2C19 loss-of-function alleles and those with one or none (HR, 1.40; 95% CI, 0.51, 3.86: P=0.517). CONCLUSIONS; CYP2C19 variants do not influence clopidogrel efficacy in Korean ischemic stroke survivors in this study. Further prospective studies are now required to confirm this finding in large scale.
11 days after stroke (p=0.001), age > 64 years (p= 0.007), and female sex (p= 0.048). Prophylactic antiinfective treatment did not influence mortality significantly in this analysis. Among surviving patients, functional outcome measured by BI was influenced by infections within 11 days after stroke (p= 0.044) and levels of monocytic HLA-DR (a marker for immunodepression) on day 3 after stroke (p= 0.0095).

Conclusion: Our findings demonstrate the impact of post-stroke infections on survival and functional outcome even years after the initial event. This observation warrants the evaluation of preventive antibiotic treatment after stroke in large phase III trials. HLA-DR is a promising marker for long-term outcome after stroke which should be further evaluated in clinical trials.

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PRESTROKE DISABILITY AND ITS ASSOCIATION TO INPATIENT MORTALITY AND LENGTH OF HOSPITAL STAY AFTER ACUTE STROKE

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BACKGROUND

Disability has been shown to be associated with poor outcome in stroke. Studies have explored the relationship between cognitive and physical functional impairment and outcomes such as post stroke physical disability, mortality and discharge to nursing facilities. However, none of these studies have considered the modified Rankin score as a prognostic poststroke indicator.

METHODS

Rankin Score (mRs) were assessed using logistic regression. Adjustments were made for age, sex, and stroke subtype (ischemic vs hemorrhagic) and severity.

RESULTS:
Our study included fourteen thousand four hundred thirty-seven individuals (52.9% female, mean age 75.4 ± 12.1) with stroke (82% ischemic) and inpatient death was 20.8%. Higher prestroke mRs was associated with significantly greater risk of mortality using fully adjusted models (for mRs=1, 2, 3, 4, and 5 vs mRs=0: odds ratio (OR)=1.28, 95% confidence interval (CI)=1.09–1.50; OR=1.50, 95% CI=1.29–1.75; OR=1.85, 95% CI=1.60–2.13; OR=2.56, 95% CI=2.15–3.04; and OR=4.48, 95% CI=3.47–5.80, respectively). There appeared to be a linear relationship where each point increase in mRs equated to being approximately 5 years older. While age and stroke type appear to be strong independent predictors of LOS, premorbid mRs also predicted longer LOS regardless of discharge status. There was very good predictability considering models which including these parameters (receiver operating characteristic: 0.82 for death and 0.65–0.70 for LOS).

CONCLUSION:
Prestroke disability predicts inpatient death and LOS, independent of age, sex, and stroke type and severity. Whether this is related to mental or physical disability should be examined in future prospective studies.

Background: Neurological deterioration during hospitalization is associated with poor outcome. However a model predicting neurological deterioration was not developed before.

Methods: A consecutive series of patients...
with ischemic stroke, who were hospitalized within 72 hours from onset between July 2007 and January 2011, were identified and used to develop the model. Neurological deterioration was prospectively captured according to operational definition: an increase of \( \geq 2 \) points in the total National Institutes of Health Stroke Scale (NIHSS) score, an increase of \( \geq 1 \) point in the level of consciousness or motor items of NIHSS score, or development of any new neurologic deficits. Potential predictors were selected from literature review and from expert opinion. Prediction model was constructed with logistic regression model and internal validation was evaluated using bootstrap selection.

Results: Among 1723 patients, neurological deterioration occurred in 273 patients (15.8%). Variables considered in the prediction model were age, sex, history of coronary heart disease, prior antiplatelet use, prior anticoagulation, thrombolytic treatment and recanalization status, diastolic blood pressure, white blood cell count, initial serum glucose, degree and location of symptomatic steno-occlusion of major cerebral arteries, interval from onset to arrival, initial NIHSS and interaction term between interval and NIHSS. The \( c \) statistic was 0.756 (95% CI, 0.725 to 0.787) in the development dataset and 0.730 (0.699 to 0.761) in the validation sample. Conclusion: Our prediction model shows relatively good model performance even in the absence of imaging information obtainable when using special computer software. However further study is necessary to improve the performance and to validate the model externally.

### Table. Results of logistic regression analysis in the prediction model for neurological deterioration

<table>
<thead>
<tr>
<th></th>
<th>Coeff (β)</th>
<th>SE</th>
<th>Wald Z</th>
<th>p</th>
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<tbody>
<tr>
<td>Age (interval from onset to arrival + 1)</td>
<td>-0.544</td>
<td>0.130</td>
<td>-4.19</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Admission NIHSS</td>
<td>-0.004</td>
<td>0.059</td>
<td>-0.05</td>
<td>0.94</td>
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<tr>
<td>Admission NIHSS²</td>
<td>0.000</td>
<td>0.002</td>
<td>0.13</td>
<td>0.90</td>
</tr>
<tr>
<td>Male</td>
<td>-0.220</td>
<td>0.148</td>
<td>-1.48</td>
<td>0.14</td>
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<tr>
<td>Coronary artery disease</td>
<td>0.431</td>
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<td>1.91</td>
<td>0.06</td>
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<tr>
<td>Antipla. pre-use</td>
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</table>

<table>
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<tr>
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<tbody>
<tr>
<td>Extracranial internal carotid artery</td>
<td>1.189</td>
<td>0.312</td>
<td>3.81</td>
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<tr>
<td>Intracranial internal carotid artery</td>
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<td>0.462</td>
<td>2.20</td>
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<tr>
<td>Middle cerebral artery - M1</td>
<td>0.723</td>
<td>0.325</td>
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<td>Middle cerebral artery – M2</td>
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<td>0.596</td>
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<td>Anterior cerebral artery</td>
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<td>Veinsial artery</td>
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<td>Initial serum glucose</td>
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<tr>
<td>White blood cell count</td>
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<td>log(interval + 1) * NIHSS</td>
<td>0.080</td>
<td>0.020</td>
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<td>log(interval + 1) * NIHSS²</td>
<td>-0.003</td>
<td>0.001</td>
<td>-2.56</td>
<td>0.01</td>
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</table>

SE, standard error; NIHSS, National Institute of Health Stroke Scale.

Figure. Receiver operating characteristic (ROC) curve, box plot, and calibration plot of the selected prediction model for neurological deterioration

A. ROC curve. The \( c \) statistics was 0.756 at 50% incidence of the outcome and was identical to the area under the curve (AUC).
B. Box plot. The discrimination slope was 0.133 which was calculated by as the difference in means of predictions for those with and those without outcome.
C. Calibration plot. The lowest smoother was close to the ideal 45° line; actual outcomes by deciles of risk were shown by triangles.
Stroke prognosis

Four-year Mortality after Stroke, Coronary Artery Disease, Peripheral artery Disease or Multiple Risk Factors in the Latin American Population of the REACH Registry

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Background and aim. Atherothrombosis is becoming the leading cause of chronic morbidity in low-income countries. For some nations, this epidemiological transition will represent an unbearable socioeconomic burden in the near future. We aimed to describe the factors associated with 4-year mortality in Latin American countries. Methods. We analyzed 1816 Latin American outpatients (62.3% men, mean age 67 years) with established symptomatic atherothrombosis (87.1%) or asymptomatics with multiple risk factors (12.9%), pertaining to the Reduction of Atherothrombosis for Continued Health (REACH) registry. Results. In patients without established vasculopathy, hypertension (89.7%), diabetes (80.8%) and hypercholesterolemia (73.9%) were the main risk factors. Of the symptomatic patients (9.1% with polyvascular disease), 57.3% had coronary artery disease, 32% cerebrovascular disease and 11.7% peripheral artery disease at baseline; with hypertension (76%), hypercholesterolemia (60%) and smoking (52.3%) as the main risk factors. All-cause mortality rate was 6.8%, 9.2%, 15.5% and 29.2% for patients with none, 1, 2 or 3 vascular disease locations, respectively. In a Cox proportional hazards model, baseline determinants of 4-year all-cause mortality were congestive heart failure [hazard ratio (HR): 3.81, 95% confidence interval (CI): 2.62−5.54], body mass index (BMI) <20 (HR: 2.32, 95% CI: 1.24−4.35), polyvascular disease (HR: 1.69, 95% CI: 1.08−2.63), hypertension (HR: 1.84, 95% CI: 1.17−2.90), age ≥65 years (HR: 1.47, 95% CI: 1.03−2.08), statin use (HR: 0.49, 95% CI: 0.36−0.68) and BMI ≥30 (HR: 0.58, 95% CI: 0.37−0.89). Conclusion. Modifiable risk factors are largely responsible for both atherothrombosis and mortality after stroke, coronary artery disease or peripheral artery disease in Latin American outpatients. The paradoxical protective effect of obesity should be clarified to avoid misinterpretations in risk prevention practices.
A Simple Risk Score for Early Stroke Mortality Derived from National Institutes of Health Stroke Scale: A Discriminant Analysis
H. Sadeghian¹, A. Zandieh², Z. Zeynali Kahaki³, M. Pourashraf⁴, S. Parviz⁵, M. Ghaffarpour⁶, M. Ghabaee⁷
Shefa Neuroscience Research Center, Tehran, IRAN¹, Iranian Center of Neurological Research, Tehran University of Medical Sciences, Tehran, Iran, Tehran, IRAN², Iranian Center of Neurological Research, Tehran University of Medical Sciences, Tehran, Iran, Tehran, IRAN³, Iranian Center of Neurological Research, Tehran University of Medical Sciences, Tehran, Iran, Tehran, IRAN⁴, Iranian Center of Neurological Research, Tehran University of Medical Sciences, Tehran, Iran, Tehran, IRAN⁵, Iranian Center of Neurological Research, Tehran University of Medical Sciences, Tehran, Iran, Tehran, IRAN⁶, Iranian Center of Neurological Research, Tehran University of Medical Sciences, Tehran, Iran, Tehran, IRAN⁷

Objectives: The aim of the current study was to design a new simpler form of National Institutes of Health Stroke Scale (NIHSS) for use in emergency settings, and compare its predictive ability with original NIHSS score for mortality.

Methods: A series of 152 consecutive patients with first ever ischemic stroke admitted to a university affiliated hospital were enrolled. NIHSS score on admission was estimated and the predictive ability of NIHSS items for mortality at 28 days was evaluated by logistic regression. Stepwise discriminant analysis was performed on NIHSS items to obtain a discriminant function with the best discriminative ability for mortality. Further, receiver operating characteristics (ROC) curves were depicted to compare the new determined discriminant function with the original NIHSS score.

Results: Cumulative rate of mortality was 11.8% for 28-day follow-up period. Among NIHSS items, scores of visual field, limb ataxia and extinction neglect were not associated with mortality (P>0.05). On the contrary, level of consciousness-commands, language and gaze were determined as independent indicators of mortality (P<0.05), and their coefficients on discriminant function were equal to 0.65, 0.44 and 0.30, respectively. In addition, area under the ROC curve of the calculated discriminant function was not statistically different from NIHSS score (P>0.05).

Conclusions: The suggested discriminant function, comprising NIHSS items of level of consciousness-commands, language and gaze, can predict 28-day mortality after stroke in a similar way to the original NIHSS score and can provide a baseline for stroke severity in emergency settings.

SERUM CALSIUM LEVELS AND OUTCOME IN PATIENTS OLDER THAN 70 YEARS OLD WITH ACUTE ISCHEMIC STROKE
S. Siasiakou, H. Koronios, B. Zisis, V. Kalogerli, L. Kalatzopoulou, L. Mantzar-
Poster Session Blue
Lisbon, Portugal 2012

812 Stroke prognosis

Carotid endarterectomy after acute ischemic event: functional neurological outcomes of patients who were operated on during at different time-points

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Republic Vilnius university hospital, Vilnius, LITHUANIA

Background: Carotid artery endarterectomy (CAE) is the main choice of treatment of patients with recently symptomatic ICA stenosis. Subgroup analyses from the randomized trials have shown that the benefit of surgery is higher if surgery is performed soon after a symptomatic event. The studies evaluating CAE outcomes are based on criteria of mortality and recurrrent strokes. The aim of this study was to evaluate the neurological functional outcomes after 3 month of symptomatic patients who were operated on at different time-points. Methods: 75 symptomatic patients undergoing CAE 2008 - 2011 in the Republic Vilnius university hospital were evaluated. Patients were divided into 3 groups: group I, operated on on ≤2 weeks (n-36) ; group II, operated on 15-28 days (n-26); and group III, patients operated on >28 days (n-13) after their

is, P. Tsiodra, S. Pagoni
3th Internal Medicine Department, Athens General Hospital <<G. Gennimatas>>, Athens, GREECE

Background: Several studies have observed an association of relatively low serum calcium levels and poor outcome among ischemic stroke patients. Our aim was to examine the association between serum calcium and albumin-adjusted calcium levels and stroke outcome.

Methods: Data were collected on all patients admitted from January 2010 to April 2011 with a diagnosis of acute stroke. Albumin-adjusted calcium level was calculated. Patients were divided based on admission’s total calcium and albumin-adjusted calcium levels into groups of low (<8.6 mg/dl), normal (8.7-9.9 mg/dl) and high (>10 mg/dl) calcium levels and statistical correlations with outcome (survival and complications during hospitalization) were examined.

Results: A retrospective study was performed. 124 patients older than 70 years (mean age 79.57±6.72 years, 50% female) were admitted with acute ischemic stroke. The mortality and the complication rate of patients with low serum calcium levels (26.3% and 36.8% respectively) were higher than those with normal serum calcium levels (9.7% and 14.63% respectively) but the difference was not statistical significant. The mortality and the complication rate of patients with low albumin-adjusted calcium levels (40% and 40% respectively) were higher than those with normal albumin-adjusted calcium levels (10.4% and 14.9% respectively) but the difference was not statistical significant.

Conclusions: Low serum calcium levels is a potential marker of increased mortality and morbidity in acute stroke patients older than 70 years old.
TIA or stroke. The neurological status was evaluated on admission, prior and after the CAE and after 3 month using NIHSS, mRS and Barthel index. Results: The patients operated on at different time-points differed in baseline neurological status, but the perioperative risk did not differ between the groups. After 3 months, the functional status of the patients who were operated on within 2 weeks after the ischemic event included less number of patients with significant disability, but the different outcomes were related to baseline patients characteristics and slower recovery process. Neurological functional outcomes after 3 month of patients operated on during recommended 2 weeks period was good: 75.8% had no disability (mRS <2) and 97% was functionally independent (mRS<3). Conclusions: The patients operated on at different time-points after ischemic event did not differ in perioperative risk. The majority of patients, operated on within recommended 2 weeks period after ischemic event had good functional outcomes after 3 month. The different outcomes between the patients groups were related to baseline patients characteristics and slower recovery process.

813 Stroke prognosis

Prediction of Stroke Outcome Using Standardised Stroke Scales: a European Validation Study

S. Ayis¹, B. Coker, A. Rudd, M. Dennis, C. Wolfe

King’s College London, London, UNITED KINGDOM

Background: Accurate prediction of stroke outcomes is relevant to patients and their families, for management and stratification into research studies. We aimed to validate a set of prognostic models and to examine their prediction of independent survival at 3 months and one year following stroke in six European populations.

Methods: Data were collected between 2004 and 2006 from first ever stroke patients in population-based stroke registers in France (Dijon), Italy (Sesto-Fiorentino), Lithuania (Kaunas), UK (London), Spain (Menorca) and Poland (Warsaw). Logistic regression models were used to predict outcomes. Models’ discrimination was quantified by the area under the Receiver Operating Characteristic curve (AUC). Modified models were developed and validated. Prediction for subgroups identified by age, gender, incontinence and admission to stroke unit was examined.

Results: A five variables mode was developed and validated, excluding pre stroke living condition from the six simple variables (age, verbal component of Glasgow Coma Scale, arm power, ability to walk, living condition), and found to be of little relevance in predicting independent survival after stroke. The AUC for prediction of one year survival ranged between 0.82(95% CI; 0.76-0.88) to 0.92(95% CI; 0.88-0.96) and model calibration using Hosmer-Lemeshow showed good fit. Other models with fairly good prediction were: “Barthel index” in the acute phase of stroke, plus age and
the National Institute for Health Stroke Scale, plus age.

Conclusions: A simple predictive model comprising five variables provided very good prediction of independent survival at 3 months and at one year following stroke across countries. The model provided highly precise estimates and was superior to other well validated measures and has potentially in trial and clinical studies.

**814 Stroke prevention**

**Aspirin resistance in ischemic stroke patients**


Hospital for cerebrovascular disease Sveti Sava, Belgrade, SERBIA

Introduction: Aspirin is the cornerstone in the primary and secondary prevention of the ischemic stroke. In some patients there is a poor platelet inhibition by aspirin and it is termed as the “aspirin resistance”, but there are still no strict definitions of the aspirin resistance or laboratory method which is used as golden standard for testing it.

Aim: The purpose of this study was to determine the aspirin non responders among our patients and to investigate the relationship between the comorbidities and the aspirin resistance in these patients.

Method: We have tested 37 patients with ischemic stroke (acute or the previous one, confirmed by CT scan or NMR imaging), 18 (51.42%) women and 17 (51.58%) men, age 37-81 years (average 62.9 ±7 years). We used impedance aggregometry for testing the effect of aspirin on the platelet function.

For statistical analysis we used Student’s t test for parametric and Fisher’s exact data for nonparametric data, we used Mathlab software to calculate the statistics.

Results: Aspirin resistance was found in 6 (17.4%) of our patients. We didn’t find any significant difference in age or comorbidities (hypertension, diabetes, hyperlipidemia or ischemic heart disease) between the aspirin responders and non responders (p>0.05). There was no significant difference in presence of the cervical atherosclerotic disease between the aspirin responders and non responders.

Conclusion: We failed to determine any comorbidity which could be associated with aspirine resistance. The limitations of our study is small number of patients and the use of single method for testing the platelet inhibition by aspirin.

**815 Stroke prevention**

**Stroke Prevention in Atrial Fibrillation - Shropshire and Staffordshire Heart and Stroke Network Approach in England United Kingdom**

I. Natarajan, E. Foster, J. Creamer, J. Oxtoby

Heart and Stroke Network Staffordshire and Shropshire and University Hospital of North Staffordshire, Stoke on trent, UNITED KINGDOM
Background
The Strategic intent of Shropshire and Staffordshire Heart and Stroke network is to ensure that within two years of the development of an Atrial Fibrillation (AF) Strategy commenced in April 2010 all health professional and members of the public would be aware of the importance of detection, diagnosis and management of those people with AF.

Method
We know from UK national information and data that warfarin is under prescribed in AF patients found to be at high risk of stroke. One way of increasing identification of this high risk group not taking anticoagulants is by using the GRASP (Guidance on Risk Assessment & Stroke prevention for AF) software audit toolkit. A target of 25% of GP practices within the network to adopt this system was set for March 2012.

What have we achieved?
- Anticoagulation for AF guidance document for General Practitioners (GP) produced.
- Guidelines for the management of cardiac arrhythmias developed.
- AF Training within Primary Care protected learning events.
- Two network wide AF training events for Primary and Secondary Health Care Professionals.
- Stroke and TIA training package ‘Can you feel it’ developed for staff working in Nursing Homes to promote awareness of irregular pulse and AF.
- Two Public Awareness campaigns being supported across the network.
- Incentivised schemes were used within some areas of the network to use the audit toolkit.
- Provision of a Nurse Specialist Warfarin initiation service

Impact so far
So far there is a 12% uptake of the GRASP audit tool kit and this is continuing to increase. This toolkit has to identify 24,734 in AF and 21,602 have now been commenced on anticoagulation. This equates to around roughly 8% of strokes prevented and anecdotally less severe strokes are presenting to the Regional Acute Stroke Units. Further work is in progress on increasing the uptake of GRASP tool kit locally and nationally.
Stroke prevention

Glycated Haemoglobin (HbA1c) as a Screening Tool for Diabetes Mellitus in Strokes and TIAs

Mercer’s Institute for Research on Ageing, St. James’s Hospital, Dublin, IRELAND

Background
Diabetes mellitus (DM) is a risk factor for stroke. It is diagnosed by measuring fasting and/or postprandial (pp) plasma glucose or glycated haemoglobin (HbA1c); the latter is a marker of medium-term glucose control in DM (1). The Stroke & TIA Clinic in St. James’s Hospital measures fasting glucose (FG) and HbA1c in new patients. In those with high HbA1c or FG we perform oral glucose tolerance test (OGTT) to check for DM. We aimed to examine if HbA1c is a more useful screening tool than FG for DM in the context of stroke and TIA.

Methods
We reviewed blood results of patients attending our clinic July 2010 - Nov 2011 for whom paired FG and HbA1c was measured. We examined results of OGTTs in patients who had elevated HbA1c or FG. We used our local laboratory reference ranges: Normal FG <6.1 mmol/L; Impaired fasting glucose (IFG) 6.1-6.9 mmol/L; FG >6.9 mmol/L = DM; Normal 2 hr pp glucose <7.8 mmol/L; 2 hr pp glucose 7.8-11 mmol/L = impaired glucose tolerance (IGT); 2 hr pp glucose >11 mmol/L = DM. Normal HbA1c 4-6%, DM =>6.5%.

Results
156 patients, 82 male, 74 female. Mean age 68 years (SD11.1). 35 had high HbA1c of whom only 16 had high FG. 22 of 35 patients with high HbA1c had OGTT done. 7 had normal OGTT, 5 had IGT and 10 had DM. 4 patients were diagnosed with DM based on high FG alone, all of whom had high HbA1c. Prevalence of DM was therefore 8.97%. Of the 19 patients with high HbA1c, but normal FG, 3 were identified on OGTT to have DM, and 3 to have IGT. 5 patients with normal HbA1c had high FG, but 4 of these had normal OGTT; on the 5th, an OGTT was not done.

Conclusions
As a screening tool for DM, HbA1c had 100% sensitivity, compared to 79% sensitivity of FG. Our research was limited by the fact that not all patients with high HbA1c and FG went on to have an OGTT. Therefore, we recommend further research into use of HbA1c as a promising screening tool for DM in the context of cerebrovascular disease.

Introduction: Studies support the atorvastatin treatment soon after stroke or TIA. The aim of the study was to assess the compliance and efficacy of the atorvastatin treatment over carotid plaque and lipids over one year of follow-up.

Methods: We prospectively studied patients treated with atorvastatin. Inclusion criteria were patients admitted due to an ischemic stroke, no previous statin treatment, and measurable atherosclerotic carotid plaque. Exclusion criteria were any previous statin treatment, symptomatic carotid plaque (>50%), patients under anticoagulation treatment and patients with neoplastic pathology or previous cervical radiotherapy. The atorvastatin dose was initiated in the Emergency Department according to usual care (10, 20 or 40 mg per day).

Results: 66 patients fulfilling all criteria 66.67% men, 33.34% women. Three patients were lost during follow-up and 19 patients stopped treatment before the course of a year (7 cases before hospital discharge by a Neurologist; in 2 cases, after discharge by the patient themselves; in 4 cases, by a General Practitioner; in 2 cases due to normal LDL levels by an Internal Medicine doctor and a Neurologist; in 4 patients due to adverse effects).

At one year, morphological characteristics of the carotid plaque were no modified. Lipid reduction was significant in triglycerides $167 \pm 76$ mg/dl vs $129 \pm 67$ mg/dl ($p=0.001$); cholesterol $193 \pm 43$ mg/dl vs $167 \pm 48$ mg/dl ($p=0.001$) and LDL cholesterol $118 \pm 36$ mg/dl vs $92 \pm 41$ mg/dl ($p<0.001$); with an increase in HDL cholesterol $42 \pm 11$ mg/dl vs $52 \pm 17$ mg/dl ($p<0.001$). No patient had a new neurological clinical event, neither ischemic nor hemorrhagic.

Conclusions: An irregular compliance has been seen after one year of atorvastatin treatment with treatment discontinuation in nearly 30% of the cases. The main effect observed was a lowering of LDL and total cholesterol and an increase in HDL cholesterol, however a longer treatment would be needed to see changes in morphological plaque characteristics.

818 Stroke prevention

Are patients who present to the Emergency Department (ED) more likely to have true TIAs than those who present to primary care?

Background Addenbrooke’s Hospital has an open referral system to TIA clinic from many sources. A standardised proforma categorises patients into those scoring <4 on the ABCD2 score (seen in clinic) and those with a score ≥4 (ei-
ther admitted or seen in TIA clinic). This study aims to identify if patients who self present to the Emergency Department (ED) or are referred urgently by primary care to the ED are more likely to have TIA’s than those patients who present themselves to primary care. Other referral sources were investigated. Methods We reviewed the database of patients attending TIA clinic from July 2008 to August 2011. Final diagnosis of TIA or stroke by a vascular neurologist or stroke physician was taken as the gold standard. We analysed the data to look at sources of referral, presenting ABCD2 score and final diagnosis. Results 1944 patients were seen in TIA clinic between July 2008 and August 2011. After excluding the 342 patients diagnosed with stroke (18%), this left 1602 patients for analysis. 1131 of patients (71%) were referred by GPs, 286 (18%) by the ED, 145 (9%) from medical specialties, 30 (2%) by ophthalmology and 7 (9%) from other sources. 997 patients had an ABCD2 score of ≤3 (63%), 471 had a score of 4-5 (29%) and 95 had a score ≥6 (6%). A diagnosis of TIA was made in clinic for 567 (35%) patients. 1031 patients (65%) had another diagnosis. There was no statistical difference in the accuracy of TIA diagnosis between ED or primary care referrals. When all secondary care referral sources were compared to primary care referrals, there was a statistical difference in accuracy of TIA diagnosis with secondary care more likely to diagnose TIA correctly (Table 1). However this is of unlikely clinical significance. Conclusion Self referral to the ED or urgent referral by primary care to ED of patients, did not reflect a greater likelihood of final TIA diagnosis. No particular referring service reviewed was superior in accurately diagnosing TIA.

<table>
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<td>16</td>
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<tr>
<td>Non-TIA</td>
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<td>176</td>
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<td>14</td>
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</table>

819 Stroke prevention

The feasibility of drug-induced hyperthermia as pre- and postconditioning in experimental stroke

F.F. Johansen, H. Hasseldam
Department of Biomedical Sciences & Biotec Research & Innovation Centre (BRIC) University of Copenhagen, Copenhagen, DENMARK

Background: Hypothermia is neuroprotective in stroke. It also induces conditioning by promoting tolerance in the brain to an ischemic insult. Here we outline the feasibility of hypothermic conditioning in reducing experimental ischemic brain damage both pre-surgical and post-stroke. Mild (35°C) prolonged (20 h) hypothermia is induced with the dopaminergic drug, talipexole - registered for treatment of patients with Parkinson’s disease.
Methods: We have previously shown talipexole-induced hypothermia and neuroprotection in rats with 30 min of middle cerebral artery occlusion (MCAO). Now we evaluate: 1) Neuroprotection of hypothermic pre- and postconditioning at 60 min of MCAO, and at 10 min of global cerebral ischemia (2-vessel occlusion + hypotension); 2) Neuroprotection after 90 days survival; 3) Whether a 3 hour poststroke therapeutic window before postconditioning is neuroprotective; and finally 4) Whether neuroprotection results from hypothermia per se. Hypothermia was induced by an i.v. bolus of 2 mg talipexole followed by 20 h continuous talipexole infusion (0, 08 mg/h).

Results: Hypothermic preconditioning and postconditioning significantly reduced infarct size in experimental stroke with long term effect and a therapeutic window of 3 hours. Experimental support to the idea of hypothermic conditioning was demonstrated by vascular endothelial growth-factor induction by talipexole hypothermic treatment solely, and by the typical late phase neuroprotection seen on day 4 after preconditioning in global ischemia. Finally, keeping the animals normothermic by a heating lamp with temperature monitor feedback abolished the hypothermic conditioning by talipexole.

Conclusion: We suggest that mild regulated talipexole induced hypothermia is a safe procedure that in hospitals might be introduced both presurgical and poststroke to ameliorate ischemic brain damage.

Atrial fibrillation (AF) is the most common cardiac arrhythmia and is a major
risk factor for thromboembolic events, including death. While antithrombotics reduce the risk of such events, many patients do not receive evidence-based prophylaxis. The aim of the ongoing Global Anticoagulant Registry in the Field (GARFIELD) is to determine the real-world management and outcomes of patients with newly diagnosed non-valvular AF and ≥1 additional risk factor for stroke. Methods: GARFIELD is a prospective/partly retrospective multicentre registry, planned to enrol 55,000 patients as 5 sequential prospective cohorts (including 1 retrospective validation group) at >1000 sites in up to 50 countries. Adults (≥18 y) diagnosed within the previous 6 weeks and ≥1 investigator-defined additional stroke risk factor are eligible for inclusion; those with a transient cause for AF or unavailable for follow-up are excluded. The registry is anticipated to take place over 6 years (starting December 2009), with 4 years of recruitment and 2 years of follow-up of each patient. Clinical sites are selected randomly and patients enrolled consecutively, regardless of whether they started oral anticoagulant therapy. Sites are representative of national AF care settings on a geographical basis and include hospitals, anticoagulation clinics, and a broad spectrum of general practitioners. Results: Data for 10,427 patients in Cohort 1 are presented. Mean age 70.1±11.2 years; 43% were women; 9.6% had a history of stroke, 6.0% a history of transient ischaemic attack, and 14.3% both. AF types were as follows: 27% paroxysmal; 18% persistent; 25% permanent; 30% new/unclassified. Overall, 81% of patients had a CHA2DS2VASC score ≥2: of these, 49.8% received anticoagulant therapy alone; 23.8% received antiplatelet therapy alone, 15.0% received both, and 11.4% received neither. Conclusion: In this large worldwide registry, over one-third of patients with newly diagnosed AF and a CHA2DS2VASC score ≥2 did not receive anticoagulant prophylaxis, demonstrating a substantial gap between evidence-based recommendations and application in practice.

Figure. Use of thromboprophylaxis according CHA2DS2VASC score (n=10,427)
are more likely to be left with major disability. Secondary stroke prevention strategies and risk factor management have been shown to reduce stroke recurrence and improve survival following an acute vascular event. However, studies observing behaviours post stroke have identified sustained behaviour change is low and adherence to secondary prevention medication taking is poor. Aims and objectives: 1. to investigate if a risk awareness intervention increases risk awareness in a stroke population following hospitalisation for acute ischaemic stroke. 2. to identify if increased risk awareness improves adherence to secondary prevention strategies such as medication taking and behaviour modification in the 3 months following discharge from hospital. Methods: A pre and post open labeled RCT intervention trial design was used to increase risk awareness in a stroke population and measure if increased risk awareness increases knowledge and behaviour changes following stroke. Analysis: Data collected from the proforma completed for each participant was double-entered into Epidata and exported to STATA-11.1 for statistical analysis (StataCorp 2007). Results: Of the 96 participants, 47 were randomised to the intervention and 49 to control. Two participants were lost to follow-up from the control group, therefore 94 patients data were analysed. Mean age was 65yrs in the intervention group and 66yrs in the control group (95% CI 12.1-12.7, P=0.56) and Males n= 30. The intervention to increase risk awareness was successful in increasing awareness (P=0.04) and resulted in a significant increase in knowledge of stroke sub-type (95% CI 0.72-0.677, P<0.001) and increased the number of healthy lifestyle behaviour changes made at follow-up (P<0.001) by the intervention arm. Conclusions: Increasing risk awareness is potentially an important mechanism to improve health behaviour following stroke and may improve risk factor control in the long-term as part of secondary stroke prevention.

822 Stroke prevention

ABCD2 scores –potential diagnostic tool for predicting Anterior Circulation TIAs and Minor Ischaemic Strokes

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Background: The ABCD2 score predicts the 2, 7 and 90 day stroke risk for a cohort of patients presenting with transient ischaemic attacks (TIAs). There is some evidence that ABCD2 scores could be used as a diagnostic tool in predicting vascular events2 but this has not been validated.

Methods: We interrogated our prospective database of all TIA patients seen at St Mary’s hospital between April 2009 to December 2010 (inclusive months) in the daily TIA clinic (Monday-Friday; 0900-1700). The information comprised of patient demographics, medical comorbidities, source of referral, rate of assessment (from time of referral), investigations undertaken (eg ECGs, Carotid Dopplers,
Results: 373 patients were seen, of which 370 had the most likely diagnosis entered into the database. 119 patients (32%) were diagnosed as nonvascular events, 45 patients (12%) had a minor ischaemic stroke, 180 patients (49%) had an anterior circulation TIA and 26 patients (7%) had a posterior circulation TIA.

Patients with a vascular event had significantly higher ABCD2 scores (mean 3.4; p = 0.0014) than those with a non-vascular event (mean 2.92). Subgroup analysis confirmed significant differences between the ABCD2 scores of the minor ischaemic stroke (mean 3.91; p < 0.0001) and anterior circulation TIA patients (mean 3.58; p=0.0002) compared to the non-vascular group. There was, however, no significant difference between the posterior circulation TIA subgroup (mean 2.73; p =0.49) compared to the non-vascular group.

Conclusion: There is evidence from our study that ABCD2 scores could be used as a diagnostic tool to help predict anterior circulation TIAs and minor ischaemic strokes. Further validation of this is required in future studies.

<table>
<thead>
<tr>
<th>Table 1: Baseline Characteristics of Sample Population</th>
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<td><strong>Total patient numbers</strong></td>
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<td>If known AF - not on warfarin</td>
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<td><strong>Prior Antiplatelet therapy</strong></td>
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<td>* No information was available on 2 patients</td>
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Can STOP Trial Velocity Criteria be applied to Iranian Children with Sickle Cell Disease?
R. Bavarsad Shahripour, R. Azarpazhooh, M. Oghbaee, S.A. Sajedi, A. Chaudhary, J. Kepplinger, K. Barlinn, K. Albright, A.V Alexandrov
Comprehensive Stroke Center, Department of Neurology, Birmingham, USA

Introduction: Although sickle cell disease (SCD) is strongly linked to stroke across all haplotypes in the pediatric population, Iranian children with Saudi-Asian haplotype are less affected by this complication. TCD is known to identify the highest risk group in African-Americans who need to receive and stay on blood transfusions, but it is unclear if the same flow velocity cut-offs can be applied to the Iranian population. We therefore aimed first to evaluate baseline TCD findings in Iranian children with SCD and no prior strokes.

Methods: Children with genetically confirmed SCD (Arabian haplotype, homozygote) and without SCD (controls) aged 3 to 16 years were prospectively recruited from pediatric outpatient clinic over a period of 9 months. We performed TCD examinations in both groups to determine flow velocities in the middle cerebral (MCA) and terminal internal carotid arteries (TICA).

Results: Of 74 screened children, 60 met the inclusion/exclusion criteria (62% female; mean age 10±4 years). Baseline characteristics did not differ between the cases and controls, except hemoglobin (Hb) which was significantly lower in the SCD group (mean 8.83±1.43 g/dL vs. 10.3±1.03 g/dL, p<0.001). In children with SCD, the highest MCA MFV (92 cm/s vs. 67 cm/s, p<0.001) and the highest TICA MFV (62 cm/s vs. 45 cm/s, p<0.001) were significantly higher than in controls. Among asymptomatic Iranian children with SCD only 1/30 (3%) had conditional >170 cm/s MFV.

Conclusions: Among Iranian children with asymptomatic SCD and without receiving recent transfusion TCD velocities could be much lower than those observed in STOP studies, and some of the high risk group may be identified with velocities lower than 170 cm/s. A prospective validation of ethnicity-specific diagnostic criteria is warranted.

A transient ischaemic attack follow-up clinic for nurses: intensifying a stroke secondary prevention
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Imperial College Healthcare NHS Trust, London, UNITED KINGDOM

Introduction: A transient ischaemic attack (TIA) is a warning sign of impending devastating stroke if not prevented. The national stroke strategy launches quality markers to improve the way we manage and treat high risk TIAs and stroke patients. There are however issues on adherence to health lifestyle advice, compliance to medications and understanding of stroke, which may all lead to recurrent TIAs and stroke.

Method:
All suspected TIA patients were initially seen in the rapid access TIA clinic for TIA work-ups and were discharged with treatment and lifestyle advice. A TIA follow-up clinic, lasting 4 to 6 weeks and consultant led, is set up to review TIA patients. A stroke nurse specialist has joined a weekly consultant’s clinic to evaluate the patient’s compliance to his medications, his treatment and lifestyle advice. A stroke nurse specialist has developed a stroke secondary prevention questionnaire (SSPQ), requesting 20 yes or no answers. A score > 0 means that the patient indicates either non-adherence to the stroke secondary prevention (diet, exercise, medication, blood pressure, weight and blood sugar). Support and advice is given to appropriate patients. A follow-up TIA session for the nurses started in September 2011.

Result:
From September 2011 to November 2011, 20 patients were seen in the clinic with a confirmed diagnosis of TIA. Out of 20 TIAs, 6 of them had a score of 5 and 2 a score of 3. Of these 20 TIAs, 8 of them could not identify any of the stroke symptoms. Of these 12 patients, only 8 demonstrated awareness of what to do when stroke happens at home. The majority were aware they should not drive within 4 to 6 weeks after TIA however 3 of them were still driving following the TIA event.

Conclusion:
Using this audit, patient’s behaviour with regard to their health is still the key to adherence to stroke secondary prevention. A stroke nurse specialist plays a vital role in continuing to support the patients through education and lifestyle advice. A nurse follow-up session is needed to identify the patients’ knowledge gap, in order to increase their stroke awareness and consequent prevention.

825 Stroke prevention
Low-dose rosuvastatin improves functional and morphological markers of atherosclerosis in healthy postmenopausal women with dyslipidemia
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Objective: Several large-scale studies have shed light on the primary preventive efficacy of statins against atherosclerotic disease including stroke in the course of treatment for dyslipidemia. However, this efficacy in the management of dyslipidemia in relatively low-risk patients has not been clarified, particularly in women. Here, we investigated the efficacy of dyslipidemia treatment with statin on three indices widely used to assess atherosclerosis, carotid IMT (CIMT), carotid stiffness beta, and brachial artery pulse wave velocity (baPWV), in postmenopausal women.

Methods: The study enrolled 51 postmenopausal women aged 55 years or older with dyslipidemia. The subjects were randomly divided into two treatment groups and received a single daily administration of rosuvastatin 2.5 mg or no statin therapy as control.
Results: At baseline, the groups did not significantly differ with regard to three indices. At 3 months, the rosuvastatin group showed a significant decrease in LDL-cholesterol, baPWV, and carotid stiffness beta over baseline values. These decreases were maintained until the end of the treatment period (12 month), at which time CIMT was significantly lower than before treatment in the statin but not in the control group. The CIMT reduction rate was correlated with both carotid stiffness beta and baPWV reduction rate at 3 months, which demonstrated that the change in CIMT in 12 months reflected the that in baPWV and carotid stiffness beta in 3 months. Interestingly, change in CIMT at 12 months correlated significantly with that of hsCRP independently of lipid profile. Conclusion: Further studies to clarify the common mechanisms underlying the link between cholesterol-lowering therapy and atherosclerosis in postmenopausal women are required.

826 Stroke prevention
The use of anticoagulation therapy in subjects with Atrial Fibrillation in the Irish Longitudinal Study of Ageing (TILDA).
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Trinity College Dublin, (The Irish Longitudinal Study of Ageing), Dublin, IRELAND

The North Dublin Population Stroke Study showed a high incidence of cardioembolic stroke secondary to Atrial Fibrillation (AF) in the Irish population and a low usage of anticoagulation. TILDA is a large population study people >50 years in Ireland. Subjects recruited to the study complete a detailed health questionnaire and are invited to undergo a physical examination including a 10 minute ECG. We determined the rate and determinants of the use of appropriate anticoagulation therapy for AF in the community.

Methods: We evaluated data from subjects recruited to the 1st phase of TILDA to determine what proportions of the population had AF, were receiving appropriate antithrombotic therapy according the European Society of Cardiology guidelines using CHA2DS2-VASc and what factors predicted non-use of appropriate therapy.

Results. 4890 subjects >49 years underwent an ECG (Mean 62 years (SD 8.4) 48% male). 118 subjects were in AF on ECG (2.4% (3.0% following correction for population burden)). Prevalence was higher in men and increased with age (50-60yrs: men 1.3%, women 0.1%, >80 years: men 19.3%, women 5.9%). 34% were on anticoagulation therapy alone and 6.9% were on joint anticoagulant anti-platelet therapy. 45 subjects (42%) were unaware of their AF. The only predictors of non-anticoagulation after controlling for age, gender and education were Fried Frailty Criteria ’pre-frailty’ (OR 3.1 , p=0.009) and polypharmacy >4 medications (OR 2.6, p=0.019). Subjects with a CHA2DS2-VASc score >1 only tended to a higher rate of anticoagulation than those scoring 1 or 0 (43% vs 27%, p=0.151 Chi Square) despite
ABCD2 score, diagnosis and secondary prevention. We used referral letters and clinical notes to collect data. We also collected carotid doppler scan reports from the ultrasound department. Results: Male 63 (42.0%), Female 87 (58.0%). 6 female and 12 male had a stenosis. 55.3% (82/150) had ABCD2 score ≥ 4. 12% (18/150) had significant stenosis (≥70%) on carotid Doppler imaging. 88% (16/18) with significant carotid stenosis, had ABCD2 score of 4 or more. ANOVA statistical analysis was undertaken which showed that higher ABCD2 score correlates with a higher degree of stenosis. (F=313.86, p= <0.01).

Conclusion: Our study demonstrates that patients with a higher ABCD2 score (4 or above) were much likely to have a degree of stenosis and did benefit from a carotid Doppler scan. This is in line with current NICE guidelines. TIA clinicians should prioritise patients with higher ABCD2 score for carotid Doppler imaging. References: NICE guidelines 2008

827 Stroke prevention
ABCD2 score and Carotid Doppler review of patients with non disabling TIA or Stroke
P. Enwere, R. Mahmood, B. Mandal, A. Kamona, R. Lisk
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Background: Patients presenting with a history of non disabling transient ischaemic attack (TIA) or stroke should be assessed with the ABCD2 score (validated tool to assess severity) and referred for a carotid doppler scan. This is the gold standard according to the National Institute of Clinical Excellence (NICE) guidelines. A high ABCD2 score (≥4) warrants a carotid Doppler done within 24-48 hours and within 1 week in lower risk group (less than 4).

Method: A retrospective audit was carried out looking at data from 150 patients, who presented to a TIA between June 2010 to November 2011. We gathered information about patient’s demographics, age, presenting complaints, ABCD2 score, diagnosis and secondary prevention. We used referral letters and clinical notes to collect data. We also collected carotid doppler scan reports from the ultrasound department. Results: Male 63 (42.0%), Female 87 (58.0%). 6 female and 12 male had a stenosis. 55.3% (82/150) had ABCD2 score ≥ 4. 12% (18/150) had significant stenosis (≥70%) on carotid Doppler imaging. 88% (16/18) with significant carotid stenosis, had ABCD2 score of 4 or more. ANOVA statistical analysis was undertaken which showed that higher ABCD2 score correlates with a higher degree of stenosis. (F=313.86, p= <0.01).

Conclusion: Our study demonstrates that patients with a higher ABCD2 score (4 or above) were much likely to have a degree of stenosis and did benefit from a carotid Doppler scan. This is in line with current NICE guidelines. TIA clinics should prioritise patients with higher ABCD2 score for carotid Doppler imaging. References: NICE guidelines 2008

828 Stroke prevention
Preadmission anticoagulation in cardioembolic stroke patient with non-valvular atrial fibrillation
Y. Hara¹, T. Nakama², K. Wada³, T. Terasaki⁴, T. Hirano⁵
Department of Neurology, Japanese Red Cross Kumamoto Hospital, Kumamoto, JAPAN¹, Department of Neurology, Japanese Red Cross Kumamoto Hospital, Kumamoto, JAPAN², Department of Neurology, Japanese Red Cross Ku-
the no-anticoagulation group, 18(51.4%) were administered antiplatelet drugs for in substitution for anticoagulation. [Conclusion] Among the cardioembolic stroke patients with NVAF, those who anticoagulation therapy was started before onset were about 60%, but in most patients PT-INR did not reach the therapeutic range.

829 Stroke prevention
STROKE PREVENTION - A POPULATION SCREENING DAY IN DISTRICT XII OF BUDAPEST
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Department of Neurology and Stroke, Szent János Hospital, Budapest Hungary, Budapest, HUNGARY¹, Department of Radiology, Szent János Hospital, Budapest, HUNGARY², Department of Internal Medicine and Cardiology, Szent János Hospital, Budapest, HUNGARY³, Department of Ophtalmology, Szent János Hospital, Budapest, HUNGARY⁴, Department of Neurology and Stroke, Szent János Hospital, Budapest, HUNGARY⁵, Department of Neurology and Stroke, Szent János Hospital Budapest,HUNGARY⁶, Department of Neurology and Stroke, Szent János Hospital, Budapest, HUNGARY⁷,Department of Neurology and Stroke, Szent János Hospital Budapest, HUNGARY⁸, Department of Neurology and Stroke, Szent János Hospital, Budapest, HUNGARY⁹

Background: Along with advances in the
treatment of acute stroke, new efforts have been made to enhance efficiency of the prevention of cerebrovascular diseases. Population screening is a way to contact high-risk patients. However, efforts are associated with high costs, so an efficient method, complying with local features, should be selected. Method: A stroke prevention day was organized. Taking advantage of the potentials of a large hospital, a comprehensive risk assessment was performed. Program of the screening day was published in the local newspaper of the district. Data of 48 residents of the XII. district were analyzed. In addition to neurologists, a radiologist, a cardiologist and an ophtalmologist were involved in the project. A data sheet was filled in for all participants, including risk factors, BMI, blood pressure and cholesterol levels. All participants had duplex sonography of the cervical vessels, cardiac evaluation and ophtalmic examination. Data were analyzed anonymously, and postcode and educational level were also recorded. Results: Among the screened, 35 were female and 13 were male. Average age was 62.86 (+/- 8.57) years, and participants were of higher educational level. Most of the individuals had 2-3 risk factors, multiple risk factors were not uncommon. 20 of 27 patients with known hypertension had target blood pressure levels. By duplex sonography, 36 individuals had mild, 4 significant atherosclerosis. There was no significant carotid stenosis. Based on ophtalmic evaluation, 26 patients had hypertensive fundus changes. Cardiac evaluation detected 14 patients with high risk. The high standard of primary care in the district was reflected by the fact that all high-risk individuals were already taken care of by general practitioners (GP-s). Conclusion: In order to increase efficiency of the program, GP-s should also be involved in the planning process, because pre-selecting high risk individuals might increase cost-efficiency.

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Is the Brazilian Family Health Program Effective for Secondary Cardiovascular Prevention in Stroke Patients? A 6-year Cohort Study


University of Joinville, Joinville, BRAZIL¹, University of Joinville, Joinville, BRAZIL², University of Joinville, Joinville, BRAZIL³, University of Joinville, Joinville, BRAZIL⁴, University of Joinville, Joinville, BRAZIL⁵, University of Joinville Joinville, BRAZIL⁶, University of Joinville, Joinville, BRAZIL⁷, University of Joinville Joinville, BRAZIL⁸, University of Joinville, Joinville, BRAZIL⁹, University of Joinville, Joinville, BRAZIL¹⁰, University of Joinville, Joinville, BRAZIL¹¹, University of Sao Paulo, Sao Paulo, BRAZIL¹², University of Sao Paulo, Sao Paulo, BRAZIL¹³, University of Edinburgh, Edinburgh, UNITED
KINGDOM, University of Joinville, Joinville, BRAZIL

Background and objective: In a 6-year follow-up of an outpatient cohort, our aim was to compare the incidence of cardiovascular disease recurrence or death after first ever stroke between those under the FHP and those under other models of care.

Methods. From 2005 to 2010, all outpatients discharged from the city public hospitals after incident stroke were followed up to stroke recurrence, myocardial infarction or death.

Results. In the follow-up period, 103 patients in the FHP units and 138 in the non FHP care units had exclusively state-run care. Over 6 years, stroke and/or myocardial infarction occurred in 30.1% (31/103) of patients in the FHP group and 36.2% (50/138) infarction occurred in 30.1% (31/103) of patients in the FHP group and 36.2% (50/138) in those under non-FHP care (RR: 0.85; 95% CI, 0.61-1.18; p=0.39); 37.9% (39/103) of the patients in FHP died against 54.3% (75/138) in non-FHP care (RR: 0.68, 0.50-0.92; p=0.01). FHP was associated with lower hazard of death from all causes (HR:0.58; p=0.005) after adjusting for age and the National Institutes of Health Stroke Scale (NIHSS). The absolute risk reduction for death by all causes was 16.4%.

Conclusions. The FHP care was associated with lower risk of death although not of stroke recurrence or heart attack after first ever stroke.
erding drugs and anti-platelets (27.7%, 22.6%, respectively). Patients who interrupted pmeds intake constituted 15% and had higher likelihood of smoking (p=0.040, OR=2.24). Barriers to comply were inconvenient dosage times (31.8% vs. 16.4%, p=0.018), lack of defined method for remembering med’s intake (56.8% vs. 41.8%, p=0.069) and difficulty getting refill on time (40.9% vs. 23.7%, p=0.019). The most frequently interrupted pmeds were lipid lowering drugs (10.6%). Conclusions: Partial compliance with meds is more frequent in younger patients, with coronary heart disease and small number of medications. Interruption in meds is more frequent in smokers. Our findings should be considered when planning interventions to improve compliance to pmeds.

832 Stroke prevention

Stroke prevention: behaviors and attitudes of the health care professionals
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Department of Neurology, Hospital de Egas Moniz, Lisboa, PORTUGAL

Background: Previous studies suggested that involvement of health care professionals (HCP) in risk factor management and patient education reflects their beliefs and attitudes about it. We aimed to investigate the commitment of HCP, involved in stroke management, to the “1 in 6” campaign of the World Stroke Organization.

Methods: All participants of the fifth Portuguese Stroke Congress were invited to answer to an anonymous structured questionnaire on arrival to the congress secretariat. The questionnaire included demographic data and six “yes” or “no” questions on commitment to each of the six items included in the “1 in 6” campaign.

Results: Among 712 participants, 347 accepted to participate (response rate 48.7%, mean age 35.9 years, male 29.1%): physicians n=193 (55.6%), nurses n=109 (31.4%), physiotherapists n=15 (4.3%), students n=15 (4.3%) and other HCP n=15 (4.3%). Commitment to each item was the following: knowledge of personal risk factors 98.6%, engage on physical activity 59.4%; avoidance of obesity 81.8%; moderation of alcohol consumption 98.5%; avoidance of cigarette smoking 86.7%; recognition of stroke warning signs and how to take action 99.7%.

Conclusion: Despite an optimal knowledge of vascular risk factors and stroke warning signs, a significant percentage of HCP do not themselves adhere to specific prevention measures. Physical activity, and to a lesser extent, avoidance of obesity and cigarette smoking, are features that should be specifically addressed in this group. The high percentage of non-respondents suggests that these results may be overestimated, nevertheless their impact in the general population should be elucidated.
833 Stroke prevention

**Stroke incidence following generic substitution of clopidogrel for cardiovascular prevention.**


Department of Neurology, Democritus University of Thrace, School of Medicine, Alexandroupolis, GREECE

**Background & Purpose:** Certain aspects of clopidogrel pharmacokinetics and pharmacodynamics are associated with adverse cardiovascular events in the clinical setting. We aimed to evaluate whether generic substitution of clopidogrel (GSOC) for cardiovascular protection can be complicated by stroke.

**Subjects & Methods:** We established a population-based registry in Evros province consisting of a largely homogeneous population. We sought to identify all subjects with first-ever stroke during a two year period using standard WHO definitions. The use of antiplatelet agents prior to stroke was documented. The sales of generic and brand clopidogrel in Evros province were recorded using the IMS Sales Analyzer Data. We also measured platelet reactivity in a subgroup of patients (during the last six months of the study period) using impedance aggregometry on a Multiplate system.

**Results:** During the first 16-month period we documented 374 cases (mean age 75±12 years) of stroke (85% ischemic, 15% hemorrhagic). Prior antiplatelet medications use included aspirin (17%), brand clopidogrel (12%), generic clopidogrel (5%) and extended release dipyridamole (0.5%). A total of 30 patients (5%) experienced a stroke within a median of 5 months (range 1-10 months) of GSOC. During the same period the sales of generic and brand clopidogrel in Evros province were 17,719 and 62,943 boxes respectively. The rate of stroke/1000 sold boxes of clopidogrel was higher for the generic (1.69‰) compared to the brand compound (1.08‰; p=0.039). Platelet non-responsiveness was documented in 50% (5/10) and 20% (1/5) of patients treated with generic and brand clopidogrel prior to stroke onset (p=0.264).

**Conclusions:** Our findings indicate that strokes may occur early after GSOC. Although the design of the present study cannot establish an association between GSOC and stroke incidence, the creation of an international registry where similar cases can be gathered may provide more reliable information regarding GSOC safety.

834 Stroke prevention

**Associations between metabolic syndrome criteria and silent brain infarction in a general Korean population**


Kangbuk Samsung Hospital, Sungkyunkwan University School of Medicine, Seoul, SOUTH KOREA

**Background:** Metabolic syndrome (MetS) has been reported to be a risk
factor for silent brain infarction (SBI). More than four sets of criteria for MetS have been proposed, but their relevance to SBI is not yet known.

Subjects and Methods: A total of 933 subjects, 565 men (51.8 ± 9.2 years) and 368 women (52.9 ± 9.6 years), were included in the present study. A diagnosis of SBI on MRI was defined as follows: (1) focal cerebrospinal fluid density, (2) distinct separation from the vessels, and (3) lesions > 3 mm. The association of MetS with SBI on MRI was compared using criteria set forth by the World Health Organization (WHO), National Cholesterol Education Program (NCEP), International Diabetes Federation (IDF), and a set of harmonized criteria. Student’s t-test and logistic regression analyses were used to calculate odds ratios (ORs) of Mets for SBI. Statistical significance was set at p < 0.05.

Results: Among the 933 subjects, 10.1% (n = 94; men, 12.0%; women, 7.1%) showed one or more SBIs on MRI. In men, defining Mets using both the WHO and harmonized criteria revealed good association with the presence of SBI, which remained significant after adjusting for age (WHO, OR: 2.48 (1.39 – 4.43); harmonized, 1.96 (1.11 – 3.32)). Using the IDF and NCEP criteria for MetS, however, failed to show a significant correlation with SBI (IDF, 1.64 (0.88 – 3.05); NCEP, 1.71 (0.91 – 3.22)). In women, no statistically significant association was found regardless of the criteria used.

Conclusions: Among the four sets of criteria used to define MetS, the harmonized and WHO criteria demonstrated a significant association with SBI in Korean men; IDF and NCEP criteria did not demonstrate a statistically significant association. We infer that the harmonized and WHO criteria for MetS are therefore more useful for predicting risk of SBI.

835 Stroke prevention

Attitude of Lombardia Stroke Unit physicians to statin prescription in acute ischemic stroke patients

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Background: Statins, thanking to their well-established pleiotropic effect, have noteworthy benefits in stroke prevention. Despite this, a significant proportion of high risk patients still do not receive the recommended therapeutic regimens, and many others discontinue treatment after being initiated, especially in the long-
term treatment. Causes for non-adherence to current guidelines are multifactorial, and depend both on physicians and patients.

The aim of this study is to identify the factors which can influence statins prescription and compliance to therapy. Our experience is based on data from the web-based Lombardia Stroke Registry.

Methods: In a sample of 8624 patients (53% male) admitted in stroke units from January 2010 to December 2011 with a diagnosis of ischaemic stroke or TIA we evaluated, by multivariate analysis, the correlation between demographic and clinical features and prescription at discharge and compliance at 3 months follow-up.

Results: Comparing the year 2010 with 2011, we found a significant increase in statins prescription rate at discharge (from 41 to 45%, p<0.05). Younger age, pre-stroke Rankin scale <2, a history of myocardial infarction, hypertension, dyslipidemia, obesity were the patient-related predictors of adherence to guidelines by prescribers. Dyslipidemia still appears as the leading factor in decision-making processes, in contrast with the newest evidence from literature. If prescribed, the compliance to statins at 3 months was 77%. A younger age, a diagnosis of stroke instead of TIA, a low NIHSS score at discharge, a better adherence to others therapies are the features able to predict a better compliance.

Conclusions: In our country statin prescription is still pulling by the presence of dyslipidemia. This factor must be considered in devising approaches to enhance adherence to guidelines by physicians, and in defining a more intensive educational program in individuals and patient groups who are more likely to discontinue treatment, to enhance long-term compliance to therapy.

836 Stroke prevention

Stepwise screening for atrial fibrillation in a 75-year old population – implications for stroke prevention

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Background: Atrial fibrillation (AF) is a frequent source of cardiac emboli in patients with ischemic stroke. AF may be asymptomatic and therefore undiagnosed. As oral anticoagulation (OAC) treatment is highly effective for stroke prevention, screening for silent AF seems suitable in risk populations. Little is however known on the yield and cost-effectiveness of such screening. The aim of this study was to explore by extended screening the prevalence of asymptomatic AF in a population aged 75-76 years.

Methods: All inhabitants in the municipality of Halmstad, Sweden aged 75-76 years were invited to a stepwise screening program for AF. As a first step, participants recorded a 12-lead ECG and
reported their relevant medical history. Those with sinus rhythm on 12-lead ECG, no history of AF and at least 2 risk factors according to CHADS2 were invited to a 2 week recording period using a hand-held ECG asked to record 20 or 30 seconds twice daily and if palpitations occurred.

Results: 1326 inhabitants were invited of whom 847 (64%) participated. Previously undiagnosed silent AF was found in 10 (1%) among 847 who recorded 12-lead ECG. Among 79 persons with known AF, 32 (41%) were not on OAC treatment. Among 379 persons with at least 2 risk factors for stroke who completed the hand-held ECG event recording, 28 (7.4%, 95% CI 4.8-10.0) were diagnosed with paroxysmal AF. Thus 70/847 (8.2%, 95% CI 6.4-10.0) of the screened population were candidates for new OAC treatment.

Conclusion: Stepwise risk factor-stratified AF screening in a 75-year old population yields a large share of candidates for OAC treatment for stroke prevention.

837 Stroke prevention

Lay perspectives on hypertension and medication adherence - a qualitative systematic review and narrative synthesis
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Division of Health and Social Care, King’s College London, London, UNITED KINGDOM

Background: Hypertension is a major preventable cause of stroke, but a large proportion of patients do not take treatment regularly. By reviewing the qualitative research, we aimed to find if patient understanding of hypertension affected medication-taking, if views differ internationally, and whether this research could inform interventions to improve adherence.

Methods: Systematic review and narrative synthesis of qualitative studies using the 2006 UK Economic and Social Research Council guidance. We searched Medline, Embase, British Nursing Index, Social Policy and Practice, and PsycInfo from database start to October 2011. Inclusion criteria: qualitative interviews or focus groups of people with uncomplicated hypertension. Exclusion criteria: studies of people with diabetes, established cardiovascular disease, or pregnancy.

Results: We included 53 studies (from US, UK, Brazil, Sweden, Canada, New Zealand, Denmark, Finland, Ghana, Iran, Israel, Netherlands, South Korea, Spain, Tanzania, and Thailand). A large proportion of participants felt hypertension was principally caused by stress and produced symptoms, particularly headache, dizziness, and sweating. Many intentionally reduced or stopped medication without consulting their doctor. Many perceived their blood pressure improved when symptoms abated or when not stressed, and that medication was not needed at these times. Participants disliked medication and its side effects, and feared addiction. These findings were consistent across countries and ethnic groups.

Conclusions: Non-adherence often resulted from patient understanding of the
causes and effects of hypertension. As beliefs about hypertension and medication were similar worldwide, calls for culturally specific education for individual ethnic groups may not be justified. To improve adherence, clinicians and educational interventions must address patients’ ideas about causality, experiences of symptoms and concerns about drug side effects.

838 Stroke prevention

The effect of multidisciplinary post-stroke care and a physical exercise program after TIA and minor stroke on secondary prevention targets - results from a pilot study (MotiveS and MoveIT)

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Background Patients with a history of ischemic stroke or TIA have a high risk of recurrent stroke and other cardiovascular events. Evidence for the effectiveness of secondary prevention strategies after ischemic stroke and TIA is compelling. In contrast to coronary heart disease, a specific rehabilitation program to influence secondary prevention targets, lifestyle factors and improve physical activity has not been implemented for stroke. Improving adherence to guidelines and lifestyle changes by standardised post-stroke care might be a powerful way to increase effectiveness of secondary stroke prevention. Methods We performed a pilot study to determine the feasibility and safety of a post-stroke care program and a physical exercise program in patients with a TIA or minor stroke. Twenty patients were randomized to either an outpatient post-stroke care program during 1 year (group 1) or to the same program in combination with an 8-week exercise program (group 2). Data were collected at baseline, 6 and 12 months after the index event. We also collected data on the percentage of patients who achieved the combined target for use of both antithrombotics, blood pressure ≤140/90 mmHg, and LDL-cholesterol ≤2.5 mmol/L. Results: No adverse events occurred. There were no significant differences in baseline characteristics between both groups (table 1). Overall, 45% of the total number of 20 patients reached the combined target for use of antithrombotics, blood pressure ≤140/90 mmHg, and LDL-cholesterol ≤2.5 mmol/L. Significantly more patients in group 2 achieved this combined target after follow-up (table 2). Conclusions: A post-stroke care program, including a physical exercise program, is feasible and safe. Interestingly, multidisciplinary post-stroke care in combination with a physical exercise program resulted in an increased attainment of secondary prevention targets compared to intensive post-stroke care alone. More studies are needed to confirm this effect.
<table>
<thead>
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<th>patients (n)</th>
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<th>group 2</th>
<th>p</th>
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</thead>
<tbody>
<tr>
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<tr>
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<td>7</td>
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</tr>
<tr>
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</tr>
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<td>n.s.</td>
</tr>
<tr>
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<td>n.s.</td>
</tr>
<tr>
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<td>4</td>
<td>2</td>
<td>n.s.</td>
</tr>
<tr>
<td>history of CHD</td>
<td>3</td>
<td>2</td>
<td>n.s.</td>
</tr>
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</table>

Table 1: baseline characteristics.
Group 1 = outpatient post-stroke care program during 1 year. Group 2 = outpatient post-stroke care program during 1 year in combination with an 8-week exercise program.
CVD = cerebrovascular disease.
CHD = coronary heart disease. n.s. = not significant.

<table>
<thead>
<tr>
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<th>p</th>
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</thead>
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<td>n.s.</td>
</tr>
<tr>
<td>LDL cholesterol ≤2.5 mmol/L (n)</td>
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<td>LDL cholesterol (mean)</td>
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<td>2.12 mmol/L</td>
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</tr>
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</table>

Table 2: secondary prevention targets. Optimal care = the combined target for use of both antithrombotics, blood pressure ≤140/90 mmHg, and LDL-cholesterol ≤2.5 mmol/L. n.s. = not significant.

839 Stroke prevention
M. Kral¹, D. Sanak², M. Hutyra³, T.
Background: Atrial fibrillation (AF) is the most common cause of cardioembolic ischemic stroke (IS). Patients with cardioembolic IS and AF often present with more severe neurological deficit associated with the occlusion of the large cerebral artery, worse clinical outcome and higher mortality. Especially paroxysmal form of AF is high risky, because it is usually not being registered during a routine electrocardiogram (ECG) examination. The aim was to assess the benefit of the early 24-hour Holter-ECG monitoring in patients with ischemic stroke and a negative history of AF.

Methods: In the prospective study, the set consisted of 114 consecutive IS patients (57 males, average age 75.4 ± 9.8 years) with a negative history of AF and without the presence of AF on the admission ECG exam. A standard 24-hour Holter-ECG was performed in all patients.

Results: Thirty-three (28.9 %) patients had concurrent ischemic heart disease, 14 (12.3 %) had a positive history of myocardial infarction and, 25 (22 %) a history of previous IS. Holter-ECG was performed on average 4.1 ± 2.5 days after the IS onset. Newly detected AF was found in 10 (8.8 %) patients (paroxysmal form of AF in 90.0 % out of these patients). No acute ischemic changes were recorded on admission ECG in all patients.

Conclusion: Holter-ECG monitoring is a noninvasive and inexpensive method used for the early detection of AF, particularly of its paroxysmal form. The risk of recurrent stroke can significantly reduced in IS patients with diagnosed AF using the anticoagulant therapy.

Acknowledgement: Supported by the IGA MH CR grant number NT/11046-6/2010.
Stroke prevention

Improving stroke prevention services: Accessibility, personalisation, communication and consistency need to be addressed.

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INTRODUCTION:
1.1 million Europeans experienced stroke in 2000. This is predicted to rise to 1.5 million by 2025. As transient Ischaemic attack (TIA) is a major risk factor for stroke its diagnosis and treatment is essential for stroke prevention. Whilst medical secondary prevention is well established the role of lifestyle advice, the patient experience of TIA follow up care and who receives such intervention is unclear.

This study aimed to identify who received TIA follow up care in an industrial socioeconomically and ethnically diverse UK city and explore the patient experience of it.

METHODS:
A two part mixed methods study was undertaken.

Part 1: Quantitative analysis of routinely collected hospital data (2007-2010) for patients who received TIA services. Predicted and actual rates of TIA were compared.
Background: Patients with a transient ischemic attack (TIA) or minor stroke have an increased risk of recurrent stroke, myocardial infarction and vascular death. Physical inactivity is an independent modifiable risk factor for stroke. The majority of patients with stroke are physically inactive. Cardiac rehabilitation, including an exercise program, reduces mortality in patients after myocardial infarction. Moreover, in healthy elderly an exercise program improves cognition. This has not been investigated in patients after TIA or stroke.

Objectives: We performed a pilot study to determine the feasibility and safety of a randomized controlled trial consisting of a post-stroke care program and an exercise program in patients with a TIA or minor stroke.

Methods: Twenty patients with a TIA or minor stroke without known cardiac contra-indications for physical activity were randomized to either an outpatient post-stroke care program during 1 year or this program in combination with an 8-week aerobic exercise program. Data were collected at baseline, 6 and 12 months after the event, and include measures of maximal exercise capacity and cognition.

Results: There were no significant differences in baseline characteristics between both groups. Eighteen patients completed the intervention. No adverse events oc-
843 Stroke prevention

SENSORY STROKE
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Background: Pure sensory symptoms are often unrecognized as a first manifestation of stroke. The aim of our study was to identify the signs that could be helpful in prevention of stroke.

Methods: We studied patients with isolated sensory loss on parts of face, and/or arm, and/or leg, but without any motor deficit, by using standard protocol: electroencephalography, Color duplex ultrasound, brain CT and/or MR with angiography and neurological examinations.

Results: We examined 78 patients age range 35 to 82, female 52, male 26 with first or repetitive sensory symptoms. 16 of those patients had a transient ischemic attack (10 without corresponding lesions on MR). 41 were with thalamic localisation of stroke (35 with ischemia, 6 with hemorrhagia). 14 had bithalamic infarctions, 7 with lacunar infarctions in corona radiata, internal capsules. MRA showed significant stenosis of aa. vertebrales and/or a. basilaris in 25 patients, hypoplasia aa. vertebrales had been found in 15 patients and 5 were with pathology of internal carotid arteries. AV malformation was found in 7 cases. 65% of lesions were located in the right hemisphere of the brain.

Conclusions: Pure sensory stroke is the most frequent in territory of posterior interior cerebellar artery and very often associated with corresponding brain lesions. Even though the sensory symptoms can appear to be minimal they must be observed with extreme caution because they can be a sign of significant pathology of extra and intra cranial arteries.

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Silent Infarction Longitudinal Evaluation for New Cerebrovascular Events:

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SENSORY STROKE
S. Atic, R. Amanovic-Curuvija, N. Radojkovic-Gligic
Hospital for cerebrovascular diseases “Sveti Sava”, Belgrade, SERBIA

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Conclusions: Pure sensory stroke is the most frequent in territory of posterior interior cerebellar artery and very often associated with corresponding brain lesions. Even though the sensory symptoms can appear to be minimal they must be observed with extreme caution because they can be a sign of significant pathology of extra and intra cranial arteries.
Background: Silent infarcts (SI) may be considered a relevant risk factor for CVD. SI show the same imaging and neuropathological characteristics of cerebral infarctions without acute clinical presentation. Our aim was to assess if an ASA preventive treatment of subjects with SI might reduce the risk of further SI, stroke, and dementia. Methods: We performed a phase IV Italian multicenter trial. This is a randomized, double-blind, placebo-controlled study of aspirin 100 mg/day for the prevention of SI and evident CVD events. We recruited subjects with at least one SI, aged ≥45 years, without previous occurrence of clinical CVD event and without contraindications to ASA therapy. Subjects were followed for 4 years assessing the incidence of ischaemic stroke, TIA and new SI assessed by MRI (primary endpoint) and incidence of new occurrence cognitive decline, vascular events, and adverse events. Results: We enrolled 53 subjects (35 F/18 M, mean age 64.6±9 yrs), who had completed a year follow-up. Hypertension occurred in 58.4%, dyslipidemia in 60.3% and diabetes in 3.7%; 18.8% were alcohol drinkers and 11.3% smokers. Subjects were randomly assigned to placebo (n=25) or ASA therapy (n=28). No difference in age, sex and routine vascular risk factors were observed between the two groups. In the ASA group one MI whereas in the placebo one there were 2 strokes, 2 new SI and 1 MI. In the ASA group, a subject had peptic ulcer. The ASA group had a significant lower incidence of new CVD than non ASA one (p 0.04, Fisher’s test). Discussion: These data show a significant increase of new CVD events in the placebo group. Despite this study is limited by the low number of cases recruited, SI seems to be a negative prognostic factor for CVD diseases. ASA preventive treatment might contribute to ameliorate SI prognosis.

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Comparing efficacy of Holter ECG and Handheld ECG in detecting relevant arrhythmias – the Primarytm study

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Background:
Many patients contact health care for palpitations, dizziness and presyncope. These patients are often referred for Holter ECG (24 hour), although the sensitivity of this investigation for detecting
relevant arrhythmias is comparatively low. A new method, intermittent handheld ECG registration at home, might be a convenient and more sensitive alternative suitable in primary care. The aim of this study is to compare the efficacy of Holter ECG and handheld ECG in detecting relevant arrhythmias in patients contacting health care for ambiguous palpitations, dizziness and presyncope. Methods: 108 patients referred for Holter ECG with ambiguous palpitations, dizziness and presyncope were asked to additionally perform a 30 second handheld-ECG (Zenicor EKG® thumb) registration at home twice daily and when having cardiac symptoms during 28 days.

Results: 92 patients, 41 men and 51 women, with a mean age of 54, 1 years, completed registration. With handheld ECG nine patients with atrial fibrillation, six patients with supraventricular tachycardia and one patient with AV-block II were discovered (17, 4% relevant arrhythmias [95% CI 11, 0-26, 4]). With Holter ECG two patients with Atrial Fibrillation (both also seen on Handheld ECG), one patient with a broad tachycardia and one patient with AV-block II were detected (4, 3% relevant arrhythmias [95% CI 1, 8-10, 6]).

Conclusions: Intermittent handheld ECG is more sensitive in detecting atrial fibrillation and paroxysmal supraventricular tachycardia in patients with ambiguous cardiac symptoms than Holter ECG. Intermittent handheld ECG can contribute to stroke prevention because of this sensitivity for detecting atrial fibrillation.

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Inpatient continuous cardiac telemetry on a hyper-acute stroke unit increases the detection of paroxysmal atrial fibrillation after stroke and TIA.

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Background: Atrial fibrillation (AF) is a common and treatable cause of acute ischemic stroke and transient ischaemic attack (TIA). Paroxysmal atrial fibrillation (PAF) is often asymptomatic and hence can be a diagnostic challenge. It is therefore of paramount importance that strategies are employed to improve the detection of AF and PAF. Post hyper acute strategies in the detection of PAF report yields of between 2.5%-8% in a stroke population. There is very limited data on the yield of continuous monitoring in the hyper acute phase. We aimed to evaluate the incidence of the new diagnoses of PAF in our inpatient stroke and TIA population using continuous cardiac monitoring and compared it to yield of PAF with daily ECGs. Study design: This was a three month prospective study on a hyper-acute stroke unit (HASU) in London on consecutive ischaemic stroke and TIA patients.

Methodology: Patients were monitored on telemetry and also had a daily ECG. PAF was diagnosed as significant when lasting greater than 10 consecutive beats. Results: Between June 2011 and September 2011, 290 patients were admitted to our HASU either with ischaemic stroke or TIA. 44 patients were excluded.
I analysed the data from a semi-rural primary care practice in the UK. The study population were those patients at an increased risk of stroke. National guidelines on ‘optimal uptake’ of preventative medications have been compared to uptake in the study group. Deficiencies highlighted in the first stage of analysis have allowed estimates for the incidence of preventable strokes.

Results

12.1% of the study population have untreated or inadequately treated hypertension, 4.5% have poorly controlled diabetes mellitus and 1.25% are not receiving aspirin or warfarin therapy despite their atrial fibrillation. The most profound result however, is the 1.5% not on aspirin therapy despite a history of stroke. Tighter control of blood pressure could prevent >2 strokes per year in the study population. Aspirin therapy in patients with cardiac disease or a history of stroke could prevent a further 13 strokes per year.

Conclusion

This study has highlighted targets for immediate change. Primary care is important as the first point of contact for information or problems, therefore, with focused primary intervention strategies these results can be improved. Despite the additional cost of treatment, prevention of stroke is the most effective way to reduce the long-term health burden.

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Stroke prevention in primary care: a retrospective analysis
R.M. Shafei
Queens Medical Centre, Nottingham University Hospitals Trust, Nottingham, UNITED KINGDOM

Introduction

Stroke is a major burden, costing around £7 billion per year in the UK alone. Eliminating modifiable risk factors is the most effective way to reduce the incidence of stroke. It is widely accepted that factors deserving the most comprehensive treatment are: hypertension, diabetes mellitus, hyperlipidaemia, smoking and cardiac disease (such as atrial fibrillation).

Methods

as they were known to have AF. 148 patients who had at least 24 hours of telemetry were included. Duration of telemetry ranged between 24 to 96 hours (mean = 46.3 hours). Out of 148 patients, we detected PAF in 14 (9.4%). Out of the 14, 2 were also picked-up on ECG (0.8%). All these patients were started on anticoagulation.

Conclusion: This study has shown a good pick-up rate of PAF on inpatient telemetry in the hyper-acute phase (9.4%). Telemetry is far superior in the detection of PAF compared to daily ECGs (9.4% vs 0.8%). We recommend routine use of telemetry for detection of PAF in ischemic stroke or TIA patients on hyper-acute stroke units.
Rehabilitation and reorganisation after stroke

The effect of exercise on mood disturbance in chronic stroke
J. Marquez¹, A. Kempton², M. Alston³
University of Newcastle, Newcastle, AUSTRALIA¹, University of Newcastle, Newcastle, AUSTRALIA², Hunter New England Health, Newcastle, AUSTRALIA³

This study investigated whether a group exercise program could have a beneficial effect on mood in people with chronic stroke. 27 community dwelling people with residual deficits from chronic stroke attended a 10 week small group exercise program. Exercises were performed once a week using a mixed training intervention model which focused on improving fitness, strength, mobility and balance. The program was conducted in a gymnasium and utilized the available exercise equipment when appropriate. Pre and post-intervention assessments of both physical function and mood status were conducted. This included the Six-minute Walk Test (6MWT), Timed-Up-and-Go Test (TUG), Step Test, Barthel Index, the Modified Rankin Scale (mRS), the Assessment of Quality of Life Scale (AQoL), the Hospital Anxiety and Depression Scale (HADS) and the Kessler-10 Scale (K-10). The results showed no statistically significant change between the median pre and post-intervention ratings of mood disorders on both the HADS and K-10. Significant improvements were made in the in the TUG (p=0.01) and 6MWT (p=<0.01) post intervention. We conclude that at present group exercise cannot be endorsed as the primary intervention in the management of post-stroke mood disorders in chronic stroke survivors.

Rehabilitation and reorganisation after stroke

A new patient-centred questionnaire for measuring Longer-term Unmet Needs after Stroke (LUNS)
R. Shannon
LoTS care LUNS study team, Bradford Teaching Hospitals NHS Foundation Trust, UK & University of Leeds, UK. Bradford Teaching Hospitals NHS Foundation Trust, Bradford, UNITED KINGDOM

Background. Stroke is associated with a complex range of long-term physical, psychological and social problems. We developed a questionnaire (LUNS) to measure longer-term unmet needs of stroke patients living in the community. Systematic reviews, qualitative interviews, preliminary testing, peer review and consumer feedback produced a 22 item questionnaire. LUNS was evaluated for suitability as a monitoring tool and outcome measure in a two phase multicentre UK study.

Methods. Phase 1: English speaking patients without cognitive impairment or aphasia returning home after at least 3 days in hospital post stroke were recruited before discharge. Phase 2: Patients with a minimum of 14 days in hospital. Cognitively impaired / aphasia / non English speaking patients were included with proxy responses. Patients in both
phases were posted a questionnaire pack (LUNS, GHQ12, Frenchay Activities Index and SF12) at up to 6 months post stroke. To test reliability patients were re-sent LUNS 1-2 weeks after receipt of the first questionnaire pack.

Results. 850 patients (651 intact cognition and communication, 199 impaired cognition / communication) were recruited. Questionnaire pack return rate was 69% with 3.5% missing LUNS data. Median number of unmet needs was 4 (range 0-19). Number of unmet needs inversely correlated with mood, quality of life and extended activities of daily living. Test-retest reliability was moderate to good (% agreement of items 78-99%, kappa statistic 0.45-0.67). Factor and Rasch analyses showed that LUNS22 displayed multidimensionality. This was solved by removing 5 items giving a 17 item questionnaire with acceptable internal consistency for group use (Cronbach’s alpha 0.77).

Conclusions. LUNS22 has suitable acceptability, validity and reliability to be used as a monitoring tool for identifying the longer-term unmet needs of an individual or in a service. LUNS17 has potential to be used as an outcome measure of the level of longer-term unmet need.

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Primary Prevention and Bone protection in post stroke, post menopausal women: An observational study
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Introduction: There are several guidelines on treatment for osteoporosis for this group. However when the same group of patients suffer a stroke, osteoporosis treatment is often avoided because of no definite guidelines in the literature at this moment. Post stroke low bone mineral density is associated with poorer outcome(1). Materials and Methods: Inclusion Criteria: Post menopausal woman over the age of 65, With Radiological evidence of stroke, Have at least 2 risk factors for fragility fractures, Able to tolerate oral medication, In patients in hospital undergoing rehabilitation post stroke, Risk factors accounted were age, corticosteroid use, immobility, Caucasian and Low Body mass Index. In-patient records of randomly selected patients over the course of 4 months (August –November 2011) along with their previous history and risk factors of stroke. Twenty eight patients which matched our selection criteria were picked with an average age of 83.5 years (range 95-65). 15% were already on some sort of bone protection agents. 78.5% of them had at least three of the 5 risk factors. Results: Only 14 percent of patients who were already on bone protection agents continued to have the treatment. Further these patients were on rehabilitation programme and were likely to suffer from further falls and increased risk of fractures.

Conclusions The prevention of osteoporosis-associated fracture should include fall prevention, calcium supplementa-
tion and lifestyle advice, as well as pharmacological therapy using agents with proven anti fracture efficacy (3). There is both a need for definite guidelines for stroke patients and increased awareness in this regard among stroke physicians to discuss and initiate treatment as early as possible. Vitamin D and Calcium supplements are simple and effective in preventing fragility fractures, indeed more so in at risk patients(4). The treatment is not only cost effective but it has several other benefits including reducing risk of future stroke and cardiovascular events (2), reducing therapy time, and increasing independence.

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It’s all just stroke and mirrors! The clinical implementation of mirror therapy to restore lower limb function and mobility following stroke and traumatic brain injury.

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Objective To evaluate the effects of mirror therapy on mobility performance and lower limb motor recovery in inpatient stroke and traumatic brain injury rehabilitation, and its feasibility in this setting.

Methods 15 stroke and traumatic brain injured patients with hemiparesis affect-
Rehabilitation and reorganisation after stroke

Changing concepts and classifications of disability for the stroke patients into ICF
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The classification on the functioning or disability explained by World Health Organization (WHO, 2001) is useful, but clear definitions of health, disablement and its related concepts of impairment, disability, handicap, activity limitation and participation restriction are needed for stroke patients in Korea. International Statistical Classification of Diseases and Related health Problems (ICD-10) has mentioned diagnosis or mortality, but has not explained the health status of living populations. In order to change this situation, WHO developed a new tool for the classification of the results of disease, the International Classification of Impairments, Disabilities and Handicaps (ICIDH). By several revising, WHO reported the International Classification of Functioning, Disability and Health (ICF) in 2001, which was not based on a medical or a social model, rather on bio-psycho-social and interactive model. Evaluation tools of disability for stroke patients in Korea is focused on medical and organic problem. There are many differences between korean tools and ICF in our study. It is very important to understand the new concept of ICF on the assessment of functioning or disability for stroke patient.

Spasticity in Practice (SPACE): a prospective, non-interventional, open-label study of botulinum toxin type A in treatment-naïve patients with spasticity
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Background: Patients with focal spasticity are managed by a multidisciplinary team. Intramuscular injections of botulinum toxin type A have become first-line treatment for many patients, but data on long-term efficacy and safety outcomes are limited. Here, we report on the design, recruitment status, baseline demographics and preliminary results of SPACE, an observational study assessing effectiveness and safety of botulinum toxin type A for treatment-naïve patients with spasticity. Methods: SPACE is an international, non-interventional, open-label study aiming to enrol ~1000 botulinum toxin treatment-naïve adults with spasticity of varying aetiologies and clinical patterns. Over ≤2 years, patients can receive any number of treatment sessions with any botulinum toxin type A product available in their country. Dose (total and per muscle), injection sites and treatment intervals are left to the discretion of the physician according to each country’s routine clinical practice. The evaluation criteria include changes in injection intervals over time, onset and duration of...
effect, global assessments of treatment effectiveness, health-related quality of life and incidence of adverse drug reactions. Moreover, data on treatment goals, injection technique, muscles treated and doses used will be collected. Results: By November 2011, 268 patients from nine countries have been recruited and treated with incobotulinumtoxinA (Xeomin®; 79%), abobotulinumtoxinA (Dysport®; 11%) or onabotulinumtoxinA (Botox®; 10%). Conclusion: Results of the SPACE study will contribute to a wider understanding of the management of spasticity with botulinum toxin type A in daily clinical practice. Data collected will inform the development and update of national and international treatment guidelines, help to improve the design of future clinical trials and support physicians who are facing the challenge of treating patients with focal spasticity on a day-to-day basis.

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Two Cases of Patients Developing Type II Diabetes Mellitus After Continuous Slow Nasogastric Feeding

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Background
Post-stroke hyperglycaemia is common, predicting poor outcomes. The association is more complex than previously thought, and possibly bi-directional. Nasogastric (NG) supplementary feeding is a commonly accepted adjunct to the management of post-stroke dysphagia. To reduce risk of aspiration, feeding is administered as a slow continuous infusion over 16-20 hours. We present two cases where this feeding strategy was associated with conversion of normoglycaemia to type II diabetes mellitus, and a purported mechanism for this association.

Reports
One patient had suffered a total anterior circulation infarction in September 2011, the other a subarachnoid haemorrhage in October. On presentation both were dysphagic and normoglycaemic (fasting glucose 5.2 and 5.5mmol/L respectively). Within 3 days of admission, both were commenced on continuous NG feed which ran at 25ml/hr over 20 hours per day. After 6 weeks, the first patient developed polyuria and a fasting blood glucose of 14.2mmol/L, while her weight had fallen by 1.2kg. At 12 weeks, the second patient had a capillary glucose of 17 and a fasting glucose of 12.6mmol/L, while his weight had slightly increased from 58.5 to 60.2kg.

Discussion
Incretins are released from the gut and augment glucose-induced insulin secretion, whilst suppressing glucagon secretion and stimulating satiety. One such incretin, Glucagon-like Polypeptide-1 (GLP-1), is released from the ileal wall in response to hyperglycaemia in the context of gastric and/or duodenal distension. Low levels of GLP-1 are associ-
bioelectrical activity in patients after ischemic stroke is still unknown.
Aim: to conduct a complex analysis of Mexicor’s influence on cerebral hemodynamics in elderly patient with cardioembolic stroke (CES).

Materials and methods: The study groups were composed of the 60-80-years old patients (30 subjects, 14 females, 16 males): 15 patients with AF had CES in left hemisphere and 15 patients with AF had CES in right hemisphere.

Duplex scanning of brain and neck vessels were performed on an ultrasound device Sonoline Elegra, Siemens. Magnetic resonance tomography was done on a tomograph 1.5 T Magnetom Vision Plus (Siemens).

Results and discussion: In patients with CES after Mexicor’s treatment cerebral hemodynamics improved in vertebral – basilar basin (in PCA before treatment linear systolic blood flow (LSBF) - 43,74±2,05, after treatment - 47,15±1,12, p < 0,05 ). This fact told us about Mexicor’s compensatory influence on cerebral blood flow.

In patients with left-sided CES Mexicor decreases peripheral resistance (Pi) (Pi before treatment 0,84±0,06, Pi after treatment 0,73±0,03, p < 0,05) and increases flexibility (before treatment 0,63±0,01, after treatment 0,67±0,02, p < 0,05) only in vessels of vertebral – basilar basin of intact hemisphere.

In patients with right-sided CES Mexicor decreases peripheral resistance and increases flexibility in cerebral vessels of both hemispheres.
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Using accelerometry to monitor the patterns of activity in acute stroke patients
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Background Accelerometry provides a continuous, detailed objective measure of activity levels and patterns. Quantifying activity by total time spent upright or the number of transitions per day may miss important factors such as the time spent in each upright (standing/walking) or sedentary (lying/sitting) episode and the distribution of these events. The aim of this study was to investigate using accelerometry the pattern of daytime sedentary behaviour and upright activity in acute stroke patients. Methods A multicentre observational study design was used. Each recruited stroke patient wore an accelerometer for one day whilst in the acute stroke unit. The length of each upright and sedentary event was determined for all patients and categorised (<5 min, 5–10 min, 10–30 min, 30–60 min, or >60 min). For each time category, the total time spent upright/sedentary was calculated as a percentage of the total time upright/sedentary. Results Sixty six patients were recruited from 3 hospitals between October 2010 & June 2011. Patient demographics were representative of the local population; with mean age of 73.2 years (SD 9.8) and similar numbers of males and females. The median time from stroke onset to the day of monitoring was 5.5 (interquartile range 4-9 days). The majority of total upright time was the result of short episodes of <10mins upright activity. The opposite pattern was observed for sedentary events whereby the majority of total sedentary time was accumulated by prolonged episodes of >60mins sedentary behaviour. Conclusion This study revealed low levels of upright activity; however, the prolonged sedentary events may be more cause for concern. Rehabilitation should be focused on reducing these inactive periods rather than overall activity. Accelerometry can provide a fuller picture of the patient’s pattern of activity and a baseline measure which could be used to inform the design and implementation of future rehabilitation interventions.

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EXPERTS’ OPINIONS OF PRACTICES IN DYSPHAGIA SCREENING AND MANAGEMENT AMONG POST-STROKE PATIENTS – NEED FOR A PROTOCOL
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Background: Dysphagia is common health condition associated with stroke. However no clear picture of dysphagia screening and management appears in the literature. This study aims at understanding dysphagia management usual practices in 4 different countries, to identify commonalities and gaps and to begin to work toward an international clinical protocol for dysphagia among post-stroke patients.

Method: A focus group was conducted with two medical doctors and two Speech-Language Pathologists (SLP), from the USA, France, Canada and The Netherlands respectively, to share their opinion about dysphagia management among post-stroke patients. Based on literature search and their practice, we designed the commonalities and differences between these four countries.

Results: North American & European guidelines recommend screening for dysphagia after a stroke, but no guidelines exist regarding which test to use. There is consensus on the screening and diagnostic pathway: with nurses administering screening, a full clinical assessment performed by SLPs is required in cases with a positive screen, instrumental evaluation (videofluoroscopy or fiberoptic endoscopic examination of swallowing) is required only if the clinical assessment result is unclear, otherwise patients go directly on to intervention. In contrast, there is variation between countries regarding the clinician who conducts the instrumental evaluation and which behavioral strategies are the common treatment base.

Conclusion: This study reflects usual dysphagia management practices with in-patients in teaching hospitals across four countries. Further assessments of practices in other countries would help understanding and raising the importance of a common dysphagia management protocol.
individuals with chronic stroke. Internal consistency, test-retest and inter-rater reliability of the mini-BESTest were assessed. Construct validity was evaluated by examining the relationship between the mini-BESTest and other established balance/mobility measures. The mini-BESTest scores were compared between (1) dependent and independent walkers and (2) those who were using an adaptive walking aid and those who were not, in order to establish known-groups validity.

Results: The mini-BESTest had high internal consistency (Cronbach’s alpha=.888-.935), test-retest [Intra-class correlation coefficient (ICC) (3,1)=.987, p<.001] and inter-rater reliability [ICC(2,1)=.948, p<.001]. The reliability results remained satisfactory when individual items were analyzed. The mini-BESTest score had significant correlation with other established balance and mobility measures, including the Berg Balance test, Timed-Up-and-Go test, and Activities-Specific Balance Confidence Scale (Spearman’s rank correlation, p<.001). Significant difference in mini-BESTest score was found between (1) dependent walkers and independent walkers, and (2) those who were using adaptive walking aid and those who were not (Mann-Whitney U tests, p<0.05).

Conclusion: Mini-BESTest is a reliable, valid, and easy-to-administer tool for assessing balance in individuals with stroke.

Psychological care of patients in an acute stroke unit
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Background
Mood disturbance affects up to 30% of patients in the first year following stroke. This is associated with higher rates of mortality, hospital re-admissions, suicide and long term disability. The Royal College of Physicians National Guidelines UK recommend assessment of mood in all stroke patients prior to discharge, and those with severe symptoms to be further assessed by an expert and offered intervention. We evaluated the prevalence of low mood in our stroke unit and recorded the types of intervention offered.

Methods
A prospective audit was carried out over 4 months in our acute stroke unit at Royal Victoria Infirmary, Newcastle Upon Tyne, UK. Data was extracted from medical notes including date of admission, type of stroke, mood assessment including date of assessment, comments on mood, use of depression scores and types of intervention offered.

Results
76 patients were identified, median age 79 (age range 35-99). 60% of patients had suffered a partial anterior circulation stroke. Mood assessment was completed in 83% of patients, most often recorded during multidisciplinary team meetings as comments in a proforma.

Of those who were assessed, 30% of patients had evidence of mood disturbance,
most commonly presenting as low mood or anxiety. It was noted that mood was difficult to assess in 16% of patients due to cognitive impairment or speech disturbances. Depression scales were used in only 2 patients.

11 out of 19 patients with documented mood disturbance had no intervention, 7 were actively monitored and 1 patient received antidepressant therapy for severe apathy.

Conclusion

Whilst mood assessment is being completed in the majority of patients, little or no intervention is being offered to patients with mood disturbance following stroke. The psychological care of patients in our stroke unit can be further improved by the use of validated depression screening questionnaires and input from clinical psychology.

The effect of a community exercise intervention on physiological and physical function following stroke: A randomized, controlled trial

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Introduction: Cardiorespiratory and musculoskeletal deconditioning following stroke can reduce activities of daily living, increasing the risk of recurrent stroke and other complications. We determined the effects of an exercise intervention on physiological and physical function following stroke.

Methods: Forty ambulant adults (>50 years) with stroke (>6 months) were randomised to either an exercise group (3 x 1 hour/19 weeks, n=20), or control group (matched duration stretching) (n=20). Pre and post intervention performance was assessed using: 1) maximal cardiopulmonary exercise testing with non-invasive (bioreactance) cardiac output measurements, 2) walking endurance (6min) and speed (10m) tests, 3) Timed Up and Go (TUG), and 4) Berg Balance Scale (BBS). Independent t-tests determined differences in change scores of dependent variables.

Results: All participants completed the trial. Peak oxygen consumption increased by 17% in the exercise group with no change in controls (18+/-5 to 21+/-5 vs. 18+/-5 to 18+/-5 ml/kg/min, p<0.01) and was attributable to a 24% increase in arterial venous oxygen difference (9.2+/-2.7 to 11.4+/-2.9 mlO2/100ml of blood, p<0.01). Maximal exercise cardiac output was unchanged. All functional measures improved significantly for the exercise group compared to controls. Walking endurance and speed increased by 20% in the exercise group (6min: 428+/-131 to 513+/-131 vs. 419+/-127 to 441+/-126m, p<0.01, 10m: 1.2+/-0.4 to 1.5+/-0.3 vs. 1.2+/-0.3 to 1.3+/-0.3, p<0.01), TUG decreased by 24% (11+/-9 to 8.4+/-6 vs. 9.8+/-5 to 9+/-5s, p=0.026) and BBS increased by 10% (50+/-4 to 55+/-2 vs. 50+/-6 to 52+/-5, p<0.01).

Conclusion: Exercise following stroke increases physiological performance and
is accompanied by improved physical function. This well tolerated therapeutic approach may provide care teams with a means to improve activities of daily living and manage the risk of recurrent stroke and other complications.

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Differential effects of cortical ischemic lesions on post-stroke motor skill recovery
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Background: Longitudinal studies suggest that only 50% of stroke survivors recover upper extremity function. Neuroanatomical factors that determine the time-course and outcome of recovery are still poorly understood. Since somatosensory feedback is essential for relearning motor skills, we tested the hypothesis that lesions to somatosensory cortices impair recovery using lesion analysis techniques.

Methods: Standardized tests of motor skill and somatosensory functions were acquired longitudinally over nine months in 29 patients with stroke to the pre- and postcentral gyrus, including adjacent areas of the frontal, parietal and insular cortices. We derived the recovery trajectories of each patient for five motor subtests using least-squares curve fitting and objective model selection procedures for linear and exponential models. Patients were classified into subgroups based on their motor recovery models. Lesions were mapped onto diffusion weighted imaging scans and normalized into stereotaxic space using cost-function masking. To identify critical neurana tomical regions, voxel-wise subtractions were calculated between subgroup lesion maps. We used a probabilistic cytoarchitectonic atlas to quantify lesion extent and location.

Results: Twenty-three patients with moderate to severe initial deficits showed exponential recovery trajectories for motor subtests that relied on precise distal movements. Those that retained a chronic motor deficit had lesions that extended to the centre of the somatosensory cortex (area 2) and the intraparietal sulcus (areas hIP1, hIP2). Impaired recovery outcome correlated both with lesion extent on this areas and somatosensory performance. The rate of recovery, on the contrary, depended on the lesion load onto the primary motor cortex (areas 4a, 4p).

Conclusion: Our findings support a critical role of uni- and multimodal somato-
Factors related to mobility and physical activity in individuals one to three years after stroke.

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Background and Purpose - Few studies have investigated the impact of both physical and psychological factors on physical activity and mobility in patients with stroke. The aims were to investigate physical and psychosocial problems one to three years after stroke and to investigate the impact of these factors on physical activity and mobility.  

Methods - A cross-sectional study conducted in Sweden, included community living individuals, 65-85 years, with stroke since 1-3 years. Self-reported and performance-based physical and psychosocial factors were assessed. The associations between these factors were studied using hierarchical linear regression analyses with mobility and physical activity as dependent variables.  

Results - Two-hundred and two individuals participated. Overweight and high BMI were common, 47% had BMI > 27. Present were also possible depressions, high ratings of falls previous year and fear of falling. Level of physical activity was low. Comorbidity was seen in 41%. Depression and HRQoL were independently related to high ratings of physical activity when adjusted for age, gender and mobility. Entered all together SPPB (p<0,001) was significantly predicting level of physical activity. Change in R² for self-reported factors were 0,07 and for the whole model adjusted R² were 0,299. All self-reported measures, except for SPMSQ and falls were independently related to high performance-based mobility. Entered all together FESS (p<0,001), PASE (p<0,001) and FOF (p=0,032) made significant contributions. Change in R² for self-reported factors were 0,219 and for the whole model adjusted R² were 0,579.  

Conclusions - Our study showed that individuals 1-3 years after stroke suffered from disabilities that are treatable. Non-motor aspects such as depression, HRQoL and self-efficacy should be considered in rehabilitation aiming to increase level of physical activity and mobility.
Gait impairment is a major consequence of stroke (Michael et al., 2005). The loading phase (LP) is a demanding period of gait, as it requires stability of the lower limb whilst the body weight transfer occurs. The LP is usually impaired after stroke, mainly due to variations in the knee joint kinematics (Lucareli and Greve, 2006), but there is no consensus about the role of knee muscles in this impairment (Ahmed and Ahmed, 2008). The aim of this study was to compare the main characteristics of the rectus femoris (RF) activity during the LP of healthy subjects and those with stroke.

Subjects with chronic stroke (N=3) and healthy controls (N=3) were recruited. A tripod sensor was placed on the RF muscle on the affected limb of stroke subjects and one (randomly selected) lower limb of healthy controls, to measure the muscle activity. Two force sensors (loading heel; contralateral big toe) were used to the LP detection. Data were collected using electromyography whilst subjects walked 10 meters, at their preferred speed. Three trials were performed. The best trial of each subject was analysed considering the (i) number of action potentials (RFap), (ii) RF activity magnitude (RFm.) and (iii) RF activity per second (RFsec.) Descriptive statistics and Mann-Whitney non-parametric tests were used for data analysis.

Subjects with stroke were 59.33+/−6.42 years old; and overweight (BMI=25.23+/−2.51kg/m²). Healthy controls were 54.33+/−1.15 years old; and normal-weight (BMI of 22.12+/−3.79 kg/m²). Subjects with stroke demonstrated a tendency to statistically significant increases in the RFap. (p=0.05) and decreases in the RFm. (p=0.05) in comparison to health controls. No statistically significant differences were observed in RFsec. (p=0.127).

This exploratory study identified modifications in RF activity in the LP of people with stroke. Further research is needed to understand the impact of these muscle activity modifications on gait recovery after stroke.
tube) in the early neurorehabilitation phase is a critical factor of life-threatening complications. Our aim was to compare localisation and etiology of central nervous system lesions in FGT-patients admitted to our acute neurorehabilitation center as determining factors for functional recovery (removal of FGT, oral food intake). Methods: We retrospectively analysed the functional outcome of 26 consecutive (01/2010 – 06/2011) patients with severe dysphagia and FGT in respect to swallowing and eating orally as rated by the Functional Oral Intake Scale for Dysphagia (FOIS, Crary M et al., Arch Phys Med Rehabil Vol 86, August 2005). Patients participated at least twice daily in an individually adapted neurorehabilitative therapy program including FOTT (facio-oral-tract-therapie), meals supervised by therapists and self-training instruction. Our interdisciplinary neurorehabilitation team assessed patients clinically at admission, regularly during the hospitalisation and before discharge. If indicated, additional fiberendoscopic exploration was performed. Results: Of 26 Patients admitted with FGT, 7 (27%) presented with nuclear or peripheral nervous (bulbar) and 19 (73%) with supranuclear lesions. Etiologies of dysphagia were ischemic stroke (62%), cerebral bleeding (19%), cerebral (4%) and cranio-pharyngeal (11%) neoplasms and neurodegenerative disease (4%). Of 19 patients with supranuclear lesions, it was possible to remove the FGT in 15 (79%) by the end of stationary neurorehabilitation. This goal was not achieved by 71% of patients with nuclear or peripheral nerve lesions. Conclusion: In our FGT patient collective, the vast majority of patients with supranuclear lesions (pseudobulbar syndrome) achieved a sufficient oral food intake (FOIS level 4-7) by the end of their neurorehabilitation stay. Only a minority of patients with nuclear or peripheral lesions (bulbar syndrome) were discharged without a FGT. In respect to the functional outcome in the rehabilitation of dysphagia, the location of the nervous system lesion appears to be more determinant than the etiology.

Predictive value of upper limb accelerometry based measurements in acute stroke with motor hemisyndrome

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Background: Recently accelerometry has been introduced into stroke research. Accelerometry is easily applicable without the cooperation of the patient which makes it a useful tool in acute stroke. This study investigated the clinical predictive value of accelerometry based
measurements of upper limb activity in patients with a motor hemisindrome after stroke. The activity variables were related to the modified Rankin Scale (mRS) to calculate the predictive value of early accelerometer-based measurements for disability status at 3 months after stroke. Methods: 129 patients with acute stroke (< 6 days after onset) were included after written consent. All patients wore 2 octagonal basic motion loggers for 48h, one at each wrist. The activity variables of 129 patients with stroke were related to the mRS score after 3 months of follow-up. To define the sensitivity and specificity and the predictive value (logistic regression) of early accelerometer-based measurements, the mRS scores were dichotomised using a cut-off value of ≤ 2. A value of 2 or less on the mRS means that a patient is at least able to look after own affairs without any assistance. Results: Sensitivity and specificity in relation to mRS for the ratio of the impaired/unimpaired arm and activity of the impaired arm (AIA) were respectively .85 and .75 (AUC = .84) and .80 and .77 (AUC = .87). The corresponding cut-off values were .33 and 597546 counts for ratio and AIA, respectively. The predictive value for disability status of AIA combined with age was 85%. Conclusions: The amount of arm use in patients with stroke presented as the activity of the impaired arm or as a ratio impaired/unimpaired arm demonstrated good sensitivity and specificity in relation to the disability status (mRS) at 3 months after stroke. Arm use also has a good clinical predictive value. Disability status defined as a mRS ≤ 2 can be predicted correctly for 85% of the patients using the activity of the impaired arm combined with the age of the patient.

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Using a process evaluation to identify the barriers and facilitators to implementing a policy of very early mobilisation in acute stroke care

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Background It is recommended that trialists who research complex interventions should include evaluations of the process of care as well as an evaluation of outcome. Very early mobilisation (VEM) of acute stroke patients is currently under investigation in a large multi-centred trial (A Very Early Rehabilitation Trial; AVERT). A parallel process evaluation was undertaken to identify the barriers and facilitators of implementing a future VEM policy into routine acute stroke care. Methods Doctors, nurses and therapists currently working in acute stroke units (ASUs) in Scotland were invited to participate in a multidisciplinary focus group or a semi-structured interview. Audiotapes were transcribed verbatim; transcripts were coded and checked for
Detailed problems and flimsy solutions: An in-depth analysis of educational material about resuming sex after stroke.

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Background—Providing written educational materials to stroke survivors is a key recommendation in many sets of international stroke guidelines. Yet, the content of educational materials on sexual concerns has not been analysed nor evaluated in published research. The aim of this study was to identify, describe, and analyse online printable educational materials on sexual concerns after stroke.

Method—Google search engine was used to locate printable educational materials from the Internet using a search term strategy of 35 phrases that were piloted for accuracy. The content of eligible materials was analysed using NVivo software to produce both enumerative and thematic data.

Results—Nine educational materials from reputable organisations were included with an average length of seven pages. The content of the materials was more similar than different and covered three main areas: (1) Problems experienced after stroke: 30% coverage, (2) Suggested solutions: 32% coverage, and (3) Reassurance: 9% coverage. Content describing potential problems reflected published research and was accurate and detailed, but the solutions and reassurance were simplistic and mostly not supported by evidence.

Conclusions—Whilst educational materials on sex after stroke may be helpful, it is important for health professionals to participate anonymity. Thematical analysis identified independent and recurring themes. Results Thirty-one healthcare professionals (17 therapists, 10 nurses & 4 doctors) across 6 hospitals participated. Ten participants had experience of delivering VEM as per AVERT trial protocol and 15 participants had no experience of delivering VEM. Emerging ‘barrier’ themes included gaining rapid access to acute stroke patients, stroke experience and the perceived risks of VEM. The ‘facilitators’ themes included resources, therapy weekend cover, educating staff in the concept of VEM, the need for a VEM evidence base, perceived benefits of the intervention and staffing structure & multidisciplinary involvement. These barriers and facilitators were identified by those with and those without experience of delivering VEM. Conclusions Not being able to access patients within 24 hours due to delayed symptom recognition, diagnosis and admission to the ASU was the most frequently mentioned barrier. The increased staff workload associated with VEM was a theme in both groups. If VEM had level 1 evidence and was seen as purposeful and beneficial to patients then staff believed it would be likely to be adopted and supported by hospital managers.
This project aims to compare 4 tests of cardiorespiratory function that could be used in a range of clinical settings for stroke survivors with varying stroke severity.

Method A non-randomised trial comparing 4 methods of assessing fitness which are available in the clinical setting: 6 minute walk test (6MWT) and submaximal testing protocols for two different types of leg cycle trainers (LT1, LT2) and arm ergometry (AE). Participants must be within 6 months of first-ever ischemic stroke, able to follow a 2 step command and have medical clearance. The project aims to recruit 30 participants, grouped by ambulation ability (Functional Ambulation Classification- FAC). There will be 10 each of independent (FAC 5-6), dependent (FAC 2-3) and non-functional (FAC 1) ambulators.

Measures include: oxygen consumption (VO2 peak), respiratory exchange ratio, % HR reserve achieved, blood pressure, rating of perceived exertion, test length and reason for test termination. Participant demographics, self selected and fast walking speed over 10m, leg strength, PHQ 9 and SAQoL are also collected.

Results To date 6 independent ambulators have been recruited (median age 79 years). Results are present in the table. Medians for heart rate reserve % achieved were: 6MWT= 41.3%, LT1= 38.8% LT2= 37.7% AE= 32.9%, median 6MWT distance= 426.5m.

Conclusion These findings suggest that aerobic fitness is very low in patients after stroke, even in those with good functional status, and suggest that there may be large potential gains from fitness training and potentially stroke secondary
the experiences of patients, families and stroke providers participating in the SDRS and 3) examine functional outcomes and cost benefit of the program. Methods: A mixed methods approach was used to evaluate the SDRS. Qualitative interviews were conducted with patients, families and stroke rehabilitation providers. The Functional Independence Measure (FIM) and length of stay data were extracted from the Canadian Institute of Health Information database. The SDRS was compared to inpatient rehabilitation from the same facility and national peer data.

Results:
Six patients attended the pilot SDRS. The total average length of stay for the SDRS was 38 days compared to 46 days for patients who attended inpatient rehabilitation only. Patients attending the SDRS experienced similar FIM gains (18 vs. 17) as those patients attending the inpatient program only. A total of 159 inpatient hospital days was saved which translates to an approximate cost savings of $101,442. The SDRS enabled patients to put into practice skills and strategies in their home environment and allowed families time to ease into new routines and understand potential challenges.

Conclusions:
The SDRS provided patients with the same intensive rehabilitation therapy as the inpatient program while enabling early integration into the community. The pilot evaluation highlights the need to examine alternate models of rehabilitation that maximize patient flow and facilitate the delivery of care in the right place at the right time.

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**Evaluating the Impact of Day Rehabilitation for Persons Recovering from Mild to Moderate Stroke**

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**Background:** Despite the emphasis on early supported discharge for stroke rehabilitation few studies have been conducted on stroke day rehabilitation programs. While the evidence is promising no details or descriptions of the actual make-up and design of the programs have been included in the literature. The objectives of the study were to: 1) describe a pilot Stroke Day Rehabilitation Service (SDRS) at a Canadian tertiary rehabilitation hospital, 2) understand...
Background: There is a paucity of evidence for dysphagia therapy; currently Speech and Language Therapists (SLTs) are reliant on basing treatment decisions on consensus opinion. However no formal method of monitoring practice patterns exists. Therefore this study aimed to determine SLTs’ approaches to dysphagia therapy with stroke patients in the UK and Ireland.

Methods: A 24 item questionnaire was developed, piloted with an expert group and delivered in a web-based cross-sectional survey targeting all UK/Ireland SLTs working in stroke. It was circulated via the UK/Ireland Royal College of Speech and Language Therapists (RCSLT) Special Interest Groups, the RCSLT Bulletin magazine and Facebook page. Questions covered background information, factors influencing therapy decisions, format of therapy recommended, outcomes and biofeedback.

Results: 138 SLTs responded from a range of clinical settings and levels of experience. 54% reported “rarely” or “never” conducting an instrumental dysphagia assessment before recommending dysphagia exercises despite 90% having access to videofluoroscopy. The most frequently recommended exercises were supervised swallow trials (“frequently” or “always” recommended by 73%) and oromotor exercises e.g. tongue range of movement (48%). Patients were treated a median of once a day [interquartile range 1-1], 3 days a week [2-5], for 15 minutes [10-20] and were asked to independently complete exercises 3 times a day [2-5]. 16% of respondents used biofeedback in therapy, only 7% systematically progressed patients’ exercises and 37% reported using standardised outcome measures.

Conclusion: This survey gives valuable insight into the dysphagia therapy practices of SLTs working in stroke in the UK and Ireland. It highlights discrepancies between reported approaches and

Figure 1: Stroke Day Rehabilitation Service Logic Model

Table 1: Day Rehab Program Compared to In-Patient and Peer Data

<table>
<thead>
<tr>
<th></th>
<th>Stroke Day Rehab Program</th>
<th>SMQL Inpatient Strokea</th>
<th>Peer Strokea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of Stay</td>
<td>38.2</td>
<td>46.1</td>
<td>43.6</td>
</tr>
<tr>
<td>Functional Change</td>
<td>18</td>
<td>16.6</td>
<td>22.3</td>
</tr>
<tr>
<td>Admission FIM Score</td>
<td>114.2</td>
<td>67.3</td>
<td>76.9</td>
</tr>
</tbody>
</table>

* Q4 2010/2011 data

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Dysphagia Therapy in Stroke: A Survey of Speech and Language Therapists in the UK and Ireland

S.K. Archer, I. Wellwood, D.J. Newham
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Background: There is a paucity of evidence for dysphagia therapy; currently Speech and Language Therapists (SLTs) are reliant on basing treatment decisions on consensus opinion. However no formal method of monitoring practice patterns exists. Therefore this study aimed to determine SLTs’ approaches to dysphagia therapy with stroke patients in the UK and Ireland.

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Conclusion: This survey gives valuable insight into the dysphagia therapy practices of SLTs working in stroke in the UK and Ireland. It highlights discrepancies between reported approaches and
recommendations from existing evidence and clinical guidelines, e.g. the need to conduct an instrumental assessment to direct dysphagia therapy (RCSLT Clinical Guidelines)

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Inclusion and Attrition of Patients with Aphasia in Acute Stroke Clinical Trials
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NMAHP Research Unit, Glasgow Caledonian University, Glasgow, UNITED KINGDOM¹, University of Nottingham, Nottingham, UNITED KINGDOM², Cedars-Sinai Medical Center, Los Angeles, USA³, NMAHP Research Unit, Glasgow Caledonian University, Glasgow, UNITED KINGDOM⁴

Introduction: Aphasia may mask capacity to consent to treatment in non-emergency trials. Evidence suggests that aphasic patients may be excluded from some stroke research as a result of language impairment. We examined the inclusion and attrition of aphasic patients in acute stroke trials to inform feasibility of retention in non-emergency trials.

Methods: We extracted data from the Virtual International Stroke Trials Archive (VISTA) on patient demography, initial impairment assessed using the National Institutes of Health Stroke Scale (NIHSS), country & year of enrolment. We defined aphasia/dysarthria using the Best Language and Dysarthria domains of the NIHSS respectively. We described the proportion of patients with aphasia who were enrolled into trials, the geographic and chronologic variations in inclusion & attrition, and formally tested associations using Proportional Odds Modelling, adjusting for age, sex, stroke severity, medical history and hemisphere affected by stroke.

Results: Aphasia affected 4,039/8,904 (45.4%) and dysarthria was present in 6,192/8,904 (69.5%) patients at baseline. Complete follow up data were available for 3,967 (98.2%) aphasic patients and 6,095 (98.4%) with dysarthria. There were no significant geographic/chronologic differences in attrition of patients with aphasia/dysarthria. Proportional Odds Modelling adjusting for case mix revealed that trial centres in Portugal enrolled fewer aphasic patients (p=0.003, OR=0.5, 95% CI [0.32, 0.74]) while centres in the Philippines comprised more patients with aphasia (p=0.0001, OR=2.5, 95% CI [1.4, 4.2]) & dysarthria (p<0.0001, OR=2.6, 95% CI [1.4, 4.6]).

Conclusion: Acute stroke research is inclusive of patients with aphasia; the methods employed across large, multi-centre trials for acute interventions have demonstrated low attrition. Similarly low levels of attrition should be feasible in non-emergency trials.
Predicting Percutaneous Endoscopic Gastrostomy (PEG) insertion after stroke: a pilot study
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Introduction
There is considerable delay in decision-making regarding insertion of PEG tubes in patients who suffered strokes. The delay in turn exposes patient to considerable risks of hospital acquired infections (1). Subsequent assessment about placement is also influenced by the evaluation on whether the patient is likely to have a PEG or not.

We already know there are several factors that can predispose the patients to have a PEG tube inserted in acute ischaemic stroke. However ‘risk factors’ are many and the decision itself to place a PEG tube is complex and guided by pathways and protocols in different trusts.

We conducted a pilot study to establish our assumptions and both on delays and also to predict PEG placement after stroke at our unit.

Materials and Methods: Records of patient who underwent PEG tube insertion were used and data collected retrospectively. Ten patient records selected randomly over last 3 years. Time interval between admission and PEG insertion was noted along with type stroke (infarct or bleed), age, previous pneumonia, cardiovascular or respiratory co-morbidities, and previous stroke and modified Rankin score.

Results: All patients were ischaemic infarcts both right sided and left sided circulation strokes were equal in incidence. Patients were all aged 65 or over. All had modified Rankin score of 4 or 5. 60% had previous strokes. 80% had co-existing cardiovascular or respiratory diseases and 90% had previous pneumonia. 50% of patients waited at least 10 weeks and 40% waited more than 10 weeks and only in one patient PEG was inserted within 6 weeks.

Conclusions: There is considerable delay in waiting times after stroke, mainly because of decision about peg placement was delayed late in course of recovery. So patients with infarcts and with co-existing co-morbidities and with modified Rankin score of 4 or higher and with previous history of pneumonia are likely to have PEG (2). These findings may have benefits in terms of early decision making, shorter hospitalization, and possible cost savings (3). It is observational study and it is planned to be a pilot study for large scale randomised study to be used in future.
The supplementary motor complex (SMC) supplied by the anterior cerebral artery (ACA) is crucial in planning of motor sequences and inhibition of inappropriate movements. Ischemic lesions at this location lead to impairment of motor control and may evoke an alien-hand syndrome (AHS) in its extreme form. The Bereitschaftspotential (BP) is considered to be generated in the SMC. Three patients were referred due to a sudden right-sided hemiplegia and a speech arrest. Neuroimaging revealed a large left-sided ACA infarction in all cases whereas primary motor cortex of the hand area was spared. Initially all three cases did not show any spontaneous hand movements. In the subacute stage, they recovered and had difficulties in initiating elementary finger movements which were associated by co-activations in the contralateral hand. This discrepancy between internally and externally cued movements persisted, i.e. grasping movements could be elicited easily by touch. In the longterm exaggerated grasping was still present, although motor control had widely recovered. Further characteristics were severe impairment in performing complex motor tasks, intermanual conflicts and involuntary, disturbing movements of the implicated limb.

Conclusion: In these cases of a large ACA infarction inability to carry out internally cued movements in the affected hand was a common and long lasting feature. Externally cued movements recovered first and were primarily not perceived by the subjects. In the longterm these non-specifically triggered finger movements persisted in the chronic stage and became disturbing as they were more and more perceived. An additional aspect of the AHS was intermanual conflict. Alteration of the BP reflecting SMC dysfunction underscores the importance of this area in the occurrence of AHS. In sum, AHS as an insidious feature of chronic ACA is a challenge for rehabilitation from ischemic stroke due to inadvertent motor activity and the deficient voluntary control.

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Changes in motor evoked potentials in the suprathyoid muscles by repetitive transcranial magnetic stimulation in healthy adult volunteers
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Dysphagia is a common and distressing consequence of a hemispheric stroke and it occurs in up to one third of patients immediately after the event. Recently, many researchers have suggested that motor cortex excitabilities increase following high frequency repetitive tran-
Objectives: To investigate the immediate effect of cane use on the gait characteristics in hemiplegic patient.

Methods: Twenty hemiplegic patients with independent ambulator under the supervision and MMSE score over 22 were included. Patients with musculoskeletal problems and diabetic polyneuropathy were excluded. A within-subject study design was used; each patient completed three walking tasks at his or her preferred walking pace. (1) no cane task, (2) single cane task, (3) quad cane task. The gait parameters were measured by Smartstep® (Andante Medical Devices Ltd., Israel) when the subject walks 10 meters in each tasks conditions. Entire foot pressure, forefoot pressure, hindfoot pressure, cadence, gait symmetry and gait velocity were measured. And repeated measure ANOVA were used to determine the statistical significance of differences in the gait parameters.

Results: The average of gait velocity and cadence with quad cane and single cane use tended to decrease. But there was no statistically significant difference. A statistically significant decrease was found for the entire and forefoot pressure of paretic side with both quad and single cane use (p<0.05). But there was no statistically significant difference in the hindfoot pressure of paretic side with both quad and single cane use. There was also no statistically significant difference in gait symmetry with quad and single cane use.

Conclusions: These results indicated that the immediate effect of quad and single cane is to decrease pressure on the entire and forefoot of paretic side in cranial magnetic stimulation (rTMS) to the motor cortex that control distal limb muscles. In addition, recent studies support the view that learning in human motor cortex occurs through long-term potentiation (LTP)-like mechanisms. However, there have been only a few reports of rTMS of the swallowing-related muscles. And there has not been conclusive evidence that cerebral cortex facilitation occurs in the swallowing-related muscles. The purpose of this study was to examine whether or not facilitation of the motor cortex related to swallowing movement occurs using rTMS. The participants of this study were 15 healthy adult volunteers, 13 male and 2 female. All participants were right-handedness. The mean age was 23 years. RTMS at 5 Hz for 30 seconds at 100% RMT and followed by a 30 second rest was repeated five times. The MEP amplitude significantly increased after the rTMS (p<0.01). The increase was about 20 to 40% and it lasted for up to 40 minutes following rTMS. It was suggested that long-term potentiation (LTP) can occur in the area of the motor cortex related to the swallowing muscles.

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The Immediate Effect of Cane on Hemiplegic Gait
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CHANGE IN FUNCTIONAL GOAL ATTAINMENT OVER TIME IN PATIENTS WITH POST-STROKE SPASTICITY (PSS) OF THE HAND AND WRIST: FINDINGS FROM THE BOTOX® ECONOMIC SPASTICITY TRIAL (BEST)

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Fachklinik Herzogenaurach, Department Neurology/Neuropsychology, Herzogenaurach, GERMANY\(^1\), Kliniken Beelitz GmbH, Clinical Department of Neurological Rehabilitation, Beelitz-Heilstaetten, GERMANY\(^2\), North Staffordshire Rehabilitation Centre, Haywood Hospital, Stoke on Trent, UNITED KINGDOM\(^3\), Department of Clinical Sciences, Karolinska Institutet, Rehabilitation Medicine, Danderyd Hospital, Stockholm, SWEDEN\(^4\), Allergan Ltd, Marlow International, The Parkway, Marlow, Buckinghamshire, UNITED KINGDOM\(^5\)

Background: Few studies have prospectively evaluated improvements in activity specifically in PSS patients. Methods: Adults with focal PSS were randomised to BoNT-A + standard care (SC) or placebo + SC for up to 2 treatment cycles. Between 24 and 52 weeks, all patients were permitted to receive open-label BoNT-A injections. The primary outcome measure was the investigator-assessed percentage of patients achieving their primary active functional goal at Week 24/10 weeks after the second injection. Secondary goals were also set for each patient. A prospectively planned subgroup analysis evaluated BoNT-A ≤240 U+SC vs placebo+SC in patients with hand/wrist spasticity. Results: This subgroup comprised of 153 patients (59% male, mean age 62 years; median time since stroke 20 months [range 3-232]). Primary active functional goal attainment at 12 weeks was demonstrated by 36.5% of patients with BoNT-A + SC vs 28.8% with placebo SC. At 24 weeks/10 weeks after the second injection, these percentages were 41.7% for BoNT-A+SC vs 28.8% with placebo SC. At 24 weeks/10 weeks after the second injection, these percentages were 41.7% for BoNT-A+SC vs 37.1% for placebo+SC (OR: 1.21; 95% CI: 0.60-2.43). Goal attainment at 52 weeks was demonstrated by 46.1% of patients remaining on BoNT-A+SC and 46.3% of patients initially randomised to placebo + SC. The difference in primary active functional goal attainment between weeks 24 and 52 in the placebo+SC group was not significant in this subgroup (p=0.0707). At 12 weeks, 41.1% receiving BoNT-A+SC had attained their secondary goals vs 31.8% of patients receiving placebo+SC. At 24 weeks this was 50.7% and 37.1% for BoNT-A+SC and placebo+SC, respectively (OR: 1.74; 95% CI: 0.87-3.49). At 52 weeks, 54.7% of patients remaining on BoNT-A+SC achieved their secondary goals vs 49.3% of patients initially receiving placebo+SC. The difference in secondary goal attainment between weeks 24 and 52 in the placebo+SC group was significant (p=0.0124). Conclusion: The addition
of BoNT-A ≤240U to SC may facilitate goal achievement in patients with hand/wrist PSS.

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Premotor cortex activation in virtual visuomotor arm coordination

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University Hospital Düsseldorf, Düsseldorf, GERMANY¹, University Hospital Düsseldorf, Düsseldorf, GERMANY², Madeira Interactive Technologies Institute, Funchal, PORTUGAL³, University Hospital Düsseldorf, Düsseldorf, GERMANY⁴, University Pompeu Fabra, Barcelona, SPAIN⁵, University Hospital Düsseldorf, GERMANY⁶, Regional Wagner-Jauregg Hospital, Linz, AUSTRIA⁷, University Pompeu Fabra Barcelona, SPAIN⁸

Background: The Rehabilitation Gaming System (RGS) is a virtual reality based device that exploits interactive technologies to deliver optimized training protocols for patients with varying neurological deficits. The aim of our study is the rehabilitation of motor deficits of the affected arm in stroke patients. In this scenario, RGS mimics the movements of the user by two virtual arms of an avatar that is embedded within a virtual world. RGS is based on the hypothesis that the combined observation and execution of defined natural motor acts induces visuo-motor coordination enhancing functional recovery of arm function.

Methods: We used event-related functional magnetic resonance imaging (fMRI) at 3T and statistical parametric mapping with random effects analysis (p<0.005) to map the brain areas activated by RGS. 18 healthy, right-handed subjects (24+/-3 years) were required to view virtual reality animations that showed a coloured ball approaching from the horizon towards the avatar in the right or left hemispace. The subjects had to indicate with a right and left button press, respectively, when to catch the target.

Results: In visually guided target catching the subjects anticipated the catch by on average 248 ms succeeding in 94+/-9 percent of the trials. In a second task the ball disappeared after 2.5 seconds and the subjects had to imagine catching it. With a right and left button press, respectively, they had to indicate when they thought to catch the target. The subjects timed the button press on average accurately succeeding in 75+/-29 percent of the trials. Activations as contrasted with viewing the virtual world occurred bilaterally in the supplementary motor area and dorsal premotor cortex as well as in the right occipital cortex. Imagery led to greater activation (p<0.005) in right inferior and medial frontal cortex, bilateral inferior parietal lobule and left cerebellum than visually guided target catching.

Conclusions: RGS induced changes in premotor and higher order brain circuits in relation to visuomotor coordination providing a neural basis for this novel, virtual reality based neurorehabilitation approach.
Predictors of length of stay in a community stroke rehabilitation centre

The Royal Bournemouth Foundation Trust, Bournemouth, UNITED KINGDOM

Background: There are no standardized benchmarks for severity specific length of stay (LOS) for post stroke rehabilitation in United Kingdom and this is usually compared to the national average. LOS in our stroke rehabilitation unit (SRU) is more than the national average. We wanted to study the predictors to help us develop successful Early Support Discharge system in order to decrease our average LOS.

Method: We retrospectively studied the data from 50 consecutive discharges from SRU and compared variables predicting LOS. Short LOS was defined as discharge to final destination within 28 days following admission. The independent variables age, sex, race, Barthel on admission and discharge, MMSE, residence before admission, independent before admission, one or more comorbidities, depression, hospital acquired infection, NG/PEG feeding, discharge destination. We used descriptive statistics for demography, chi-square and two sample t-test for the analysis.

Result: Among 50 patients 20 had LOS less than 28 days (Table 1). Patients lived at home prior to admission (p=0.03) and discharges to usual place of residence (p=0.005) were associated with shorter length of stay. Low MMSE on admission (p=0.007), Incontinence (p=0.001) and one or more episode of hospital acquired infection (p=0.01) were significant predictors of longer length of stay in stroke rehabilitation unit. Severity of stroke (Barthel index) was not significantly different between two groups.

Conclusion: All efforts should be made to prevent incontinence and hospital acquired infection in acute and sub-acute phase of stroke for successful early discharge of care to ESD team.

Portuguese Adaptation of the Stroke and Aphasia Quality of Life Scale-39 (SAQOL-39)
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866  Scientific Programme
Objective: The main purpose of this study was to translate and assess the psychometric properties and reliability of the Portuguese version of the SAQOL-39 in a group of chronic aphasia patients.

Method: We use the translation and reversion method from the original scale to assure conceptual uniformity. The instrument was administered on 33 aphasia patients. Internal consistency was assessed with Cronbach’s alpha and test-retest reliability was explored (n=12). We also use Pearson’s and Spearman’s Correlations coefficients to determine the correlations between the SAQOL-39 domains and other social and clinical variables. Results: The translation process from the original scale occurs without difficulties. Cronbach’s alpha for SAQOL-39 was $\alpha = 0.953$ and for each subdomains ranged from 0.882 (Psychosocial) to 0.971 (Physical domain). The test-retest for total SAQOL-39 was 0.927 and for the subdomains (ranged from 0.80 to 0.97). The global scores show no floor or ceiling effects and there was no missing data. There was no significant association between total SAQOL-39 score and years of education ($r=.40$ $p=.18$) or age ($r=.77$, $p=.670$). We found a significant correlation between Communication Domain mean score and the Aphasia Quotient outcome ($r=.62$ $p=.000$). Conclusions: Despite the small sample size the Portuguese version of the SAQOL-39 showed good internal consistency and test-retest reliability. This study also shows preliminary evidence for good acceptability, feasibility and reliability of this adaptation. The importance of communication ability in perceiving the quality of life of patients with aphasia has also been highlighted.

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Functioning and disability in stroke patients: the ICF brief core set for stroke

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BACKGROUND. Cerebrovascular diseases are among those that cause the greatest impact on society and health.
Rehabilitation and reorganisation after stroke

BTX-A effectiveness in stroke: patient point of view
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Introduction: Muscle spasticity causes pain, disability and difficulties in the rehabilitation of patients with upper motor-nerve disease such as stroke and cerebral palsy (CP). Therefore, when managing CP in children and in patients with stroke sequelae, reduction of spasticity is crucial. Several treatment options, including botulinum toxin type A (BTX-A) injection, have been used to reduce spasticity. Botulinum toxin type A injections are indicated to: (1) improve motor function; (2) improve the quality of life by decreasing spasticity and/or decreasing caregiver burden; (3) decrease pain from spasticity; (4) enhance self-esteem by diminishing inappropriate motor responses; and (5) provide a presurgical diagnostic tool.

Many reports have demonstrated that BTX-A can reduce spasticity improving locomotor ability, however few studies have addressed the effectiveness of BTX-A injection assessed subjectively by patient self-appreciation.

Objectives: the purpose of this study was to determine patients satisfaction after being treated with BTX-A. Study enrolling consecutive patients treated with BTX-A, as outpatients in the Physical and Rehabilitation Medicine department of Hospital de São João, between May...
2009 and May 2011. Methods: multiple choice telephonic questionnaires were used to obtain information regarding patients’ expectations, degree of satisfaction with the treatment, degree of functional and clinical improvement, incidence of side effects, type of treatment done after the injections and overall patient self-appreciation and desire to repeat the procedure.

Results: 56 patients were evaluated (no patients were excluded), mean age was 35 years. Status pos-CVA (51.9%) and CP (37.5%) were the main diagnosis. Side-effects were reported in 5 patients, 3 of which referred a flue-like syndrome and 2 loss of function. Most patients assessed the BTX-A injections as an important tool in their rehabilitation process and were very pleased with the results (98.1%). However, 10.7% were unsatisfied with the results.

Conclusion: from a patient point of view it can be concluded the BTX-A is an effective, safe procedure that plays a central role in spasticity management.

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Quality of Life and Disability in Patients with Stroke
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Background: The aims of the present study were to assess the impact of stroke on HRQoL and disability, the relationships between the two constructs and to what extent the two dimensions are affected when the general health state changes (in terms of perceived improvement or worsening) or when the health state is more stable.

Methods: The WHO Disability Assessment Schedule (WHO-DAS II) and the 36-Item Short-Form Health Survey (SF-36) were administered via mail to a sample of adult stroke survivors. Comparison against normative Italian values was made using one-sample t-test; SF-36 and WHO-DAS II scores were compared between employed and unemployed patients, and between patients self-reporting improved, unchanged and decreased
health state using ANOVA with LSD post-hoc test; the relationships between SF-36 and WHO-DAS II were assessed using Pearson’s correlation. Results: 111 patients were enrolled. SF-36 and WHO-DAS II of stroke patients were worse in comparison with Italian normative values. Moderate to strong correlations between all scales and summary score of WHO-DAS II and SF-36 were found: the worse the disability the lower the HRQoL. Patients reporting worse health status in the previous year reported higher levels of disability and lower HRQoL. Employed persons had higher HRQoL and lower disability levels.

Conclusions: The relationship between HRQoL and disability after stroke should be further studied to get a wider understanding of the different aspects of disability and HRQoL that are most relevant for the persons after stroke.

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**BOLD activation pattern for motor task in chronic stroke patients after administration of autologous mononuclear and mesenchymal stem cells**

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The aim was to observe safety, feasibility and efficacy of autologous bone marrow mononuclear and ex vivo expanded mesenchymal stem cells in chronic stroke patients. Twenty adult chronic stroke patients were recruited from the stroke clinic with MRC grade for wrist and hand muscles > 2, NIHSS scale between 4 and 20, between 3 months to two years of stroke onset, conscious able to comprehend. 50-60 ml of bone marrow was aspirated under aseptic conditions. The mean isolation time for mononuclear stem cells was 150+/-20 minutes administered to fourteen patients. The expansion of mesenchymal stem cells took 23+/-5 days which were administered to six patients. Each patient was infused with 5x10^8 cells in 250 ml saline intravenously over a duration of 150+/-10 minutes. Functional MRI was performed at baseline and 24 weeks. The motor task used was either fist making or extension of wrist, depending upon the compliance. Block design with alternate baseline and activation task was used with a total of 90 whole brain EPI measurements. Twenty age matched healthy individuals were recruited for comparison with stroke patients. The clinical, laboratory and radiological reports were normal in all patients and did not report any serious adverse events till 24 weeks follow up. There was no statistical significant difference in the clinical scores between MNC and MSC groups at 24 weeks (p<0.05). There was a significant increase in the number of voxels in the Brodmann area 6 at 24 weeks in all the patients (p>0.05). There was a considerable increase in the laterality index of ipsilesional cortex. On BOLD activation, we observed an activation of 63 voxels in right BA 6, 101 voxels in 35 and 25 voxels in 40. With an increased number of voxels recruited in premotor,
primary motor cortex, inferior parietal lobule and hippocampal gyrus at follow up, we assume that stem cell therapy leads to cortical re-organisation. The restitution principle of plasticity can be supported by an increased activation of motor cortex in the stem cell group when compared with healthy controls.

Figure 1. BOLD activation MNC with respect to MSC in right hemispheric stroke overlaid on anatomical images.

Figure 2. BOLD activation in stem cell group with respect to healthy controls overlaid on anatomical images.

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The correlations among impairment, thinking operations and daily activities after stroke

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Background: there is a great need to find valid, reliable measures of cognitive outcome after stroke. Measures of higher cortical function developed for other disorders, are impractical for many stroke victims. On the other hand, there are tests of Activities of Daily Living (ADL) that require intact performance in categorization, sorting and reasoning. Hypothesis: ADL tests dependent on cortical functions could be used to assess outcome in stroke patients.

Method: 27 right-handed stroke patients were evaluated on National Institute of Health Stroke Scale (NIHSS), Barthel Index (BI), Instrumental Activities of Daily Living (IADL) Scale and thinking process items of Lowenstein Occupational Therapy Cognitive Assessment (LOTCA). Results: Correlations between thinking process subtests of LOTCA and different items of NIHSS such as consciousness, arm movement, aphasia, ataxia and inattention was significant. Spearman correlation of thinking process and BI tasks showed no relationship, although Structured Risk of thinking process evaluation was correlated to both self-care and mobility areas of the BI. Thinking process was strongly related to IADL total score (p=0.004). The total NIHSS correlated significantly with BI and IADL total scores. Conclusion: higher-order functions, such as categorization, sorting and reasoning, are related to IADL performance which depends on complicated cognitive abilities. In con-
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How do predicted energy requirements compare to an armband device that indirectly measures energy expenditure in stable stroke patients?
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Background:
There is limited published research regarding energy requirements following stroke. Difficulties lie in calculating energy demands at different stages in the stroke care pathway due to factors such as the extent of stroke and changes in physical activity levels. New technologies such as the Bodymedia SenseWear® armband device (BMD) which has been evaluated against other gold standard methods are non-invasive, easy to wear and offer opportunities to more accurately determine energy expenditure in a hospital setting.

Method:
A prospective observational study was conducted on 30 stroke patients. Energy expenditure was indirectly measured using the BMD over 24 hours. The Harris-Benedict (HB) and Schofield predictive energy calculations were compared with the BMD results. Agreement was defined as within 100kcal (+/-) of the BMD result. Data on anthropometry, functional and nutritional status was collected and patients were screened for hyper-metabolism.

Results:
The population included mainly ischaemic strokes (77%). Schofield BMR had the highest level of agreement with BMD overall (50%) while HB basal energy expenditure (BEE) had 43% agreement. When an activity factor was added to Schofield, agreement with BMD reduced. The average metabolic equivalents ratio (METs) ranged from 0.74-1.27, which corresponds to resting/sedentary activity levels. Table one shows the level of agreement based on functional status. The majority of patients had a normal BMI and 63% were at medium to high risk of malnutrition as defined by the malnutrition universal screening tool ‘MUST’. Enteral tube feeding was required in 17% of patients.

Conclusions:
Overall, the predictive equations had low levels of agreement with the BMD. This may be attributed to the low levels of physical activity in this population and an over-estimation of activity factors applied. This study also highlights the requirements for nutrition support interventions in the stroke rehabilitation
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Development and validation of Asian Stroke Disability Scale (ASDS)

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Background: Asian Stroke Disability Scale (ASDS) was designed as a functional impairment and handicap assessment tool. This study presents development and validation of ASDS. Methods: Three items including: self-care, mobility, and daily activities were selected as variables for development of the ASDS. The variables were provisionally graded on a 2- to 4-point scale based on importance of each item. Each of the variables was categorized into 3 categories. 125 rater-patient assessments for each of the mRS, BI and ASDS were performed on 25 stroke patients by 5 raters. For categorization of functional impairment as minor or major, the scores of mRS, BI and ASDS was dichotomized at ≤2, >2; ≥90, <90 and <3, ≥3 respectively.

Results: The quantitative variability of BI, mRS and ASDS scores between 5 raters was not significant; (df=4, F=1.061, 95% CI=52.639-62.400, p=0.379), (X²=1.758, df=4, p=0.780), (X²=1.454, df=4, p=0.835) respectively. Interrater variability of mRS, BI, and ASDS scores by whole of the 5 raters based on the qualitative categorization was not significant; (X²=0.553, df=4, p=1), (X²=0.869, df=4, p=0.978), and (X²=1.434, df=4, p=0.901) respectively. The paired interrater variability of mRS, BI and ASDS scores based on qualitative categorization was not significant for the three methods, p>0.05. Conclusion: The ASDS is a simplified functional impairment and handicap scale which is as reliable as mRS and BI in the stroke patients.
Is Locomotor Training with Body Weight Support Better for Walking than Classical Intensive Neurorehabilitation? Controversies
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Introduction
Medical rehabilitation helps the patients to reach fullest physical, psychological, social, vocational and educational potential. New, robotic aided rehabilitation has advantages, but results are controversial. Aim to compare classical and new neurorehabilitation procedures

Material, Methods
Cochrane, Database, Embase, ISI (1999-2011), own materials: 60 children, mean age 9.7 +/- 4.3, with motor and cognitive disorders of various origin, mainly hypoxic, divided in two subgroups: 1. (n=30) 30 sessions of neurobiofeedback, 2-3 times/week/30-45 mins, 2. (n=30) standard rehabilitation, the same frequency and duration. PANESS and CIS tests (assessing motor ability, impulsivity, attention) before and after procedures, Statistical analysis: paired t-test.

Results
Literary data showed that treadmill locomotor training with body-weight support, was not superior to home-based neurorehabilitation in improving walking. 52% of participants improved their walking function but with no significant differences (odds ratio 0.83 with 95% CI). Walking speed 0.23 m/s vs 0.25 m/s (NS). Mean HR 90/min vs 77/min (p<.001). Stroke pts with weight supported program were no better than pts with classical in-hospital or home-based exercise program. Moreover, locomotor training is more expensive, requires both, more staff and more training. Classical neurorehabilitation is more feasible. Our study showed significant improvement in all followed parameters comparing neurofeedback vs classical rehabilitation group: 1. gait, hopping, stations: 14.067 vs -1.933 (p = .002), 2. achieved time 17.373 vs 21.831 (p = .02), 3. repetitive movements 20.057 vs 0.833 (p = .001)

Conclusions
Controversies regarding the results with body weight supported training, neurobiofeedback and classical in-hospital or home-based exercise program persist. There exist clear advantages of locomotor body weight supported and robotic training. The results are controversial comparing to standard neurorehabilitation. New studies are needed.

Sup. By EU grants EU26220220099,
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Background: post-stroke fatigue is common and distressing. Its aetiology is uncertain. In Chronic fatigue syndrome cortisol dysregulation has been demonstrated. Dysregulation of the hypothalamic-pituitary-adrenal axis which secretes cortisol is common after stroke. We sought to determine a) the feasibility of measuring salivary cortisol one month after stroke onset and b) its relationship with post-stroke fatigue.

Method: We recruited patients from an ongoing longitudinal cohort study of post-stroke fatigue. Those with dysphagia were excluded. Patients collected saliva samples themselves one month after stroke onset using a Salivette sampling device at 0800h and 2200h on one normal weekday. Levels of saliva cortisol were analysed using a standard ELISA. We recorded the presence or absence of fatigue using a validated case definition.

Results: Of 38 consecutive patients two had dysphagia and were excluded, nine refused and samples from a further three patients contained no saliva in at least one of the tubes. Of the 24 patients with measurable cortisol, four had a reversal of diurnal variation. Of remaining 20 patients (mean age 72.1 years, 11 male), morning mean cortisol was 18.93 nmol/l (SD 8.29) in the fatigued group (n = 6) compared with 21.44 nmol/l (SD 14.3) in non-fatigued group (p>.05) and evening mean cortisol was 3.56 nmol/l (SD 1.84) in fatigued group and 5.08 nmol/l (2.52) in non-fatigued group (p>.05).

Conclusion: Salivary cortisol measurements are feasible after stroke. In this small study, we found reversed diurnal variation in 4 patients, but no association between cortisol and fatigue in the remaining patients. These data will be used to inform power calculations for a much larger study evaluating associations between post-stroke fatigue and cortisol.

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Study about the motor and cognitive performances on patients with lacunar stroke treated with neurotrophic factors

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Objective: Our goal was to evaluate the motor and cognitive performances in the patients with lacunar strokes treated with neurotrophic factors in comparison to those who did not received them.

Material and methods: We studied 68 patients with the diagnosis of lacunar stroke and who met the inclusion criteria: age between 60-80 years, 10 to 12 years of education, at least 4 lacunae at CT-scan exam and the score on Rankin Scale for motor handicap less than 2. The patients were divided in 2 groups. The group I was composed of 38 patients (20 women and 18 men), average age 69.6 years; they received neurotrophic factors 10ml/day for 15 days alternating with 45 days of pause for 2 years. The group II was composed of 30 patients (20 women and 10 men) average age 69.9 years.
who did not received neurotrophic factors. We treated all the patients with antiplatelet agents and also our patients received a properly treatment for the associated diseases (arterial hypertension, diabetes mellitus, hypercholesterolemia, atrial fibrillation). We evaluated the patients using Mini-Mental State Examination (MMSE), the Clock Drawing Test (CDT) and Montreal Cognitive Assessment Scale (MoCA) in order to appreciate the cognitive performances. The motor status was evaluated by Rankin Scale. The patients were examined at baseline, 6 months later and after one year. The results were analyzed by Student Test.

**Results**

The patients in group I showed in dynamics better results in comparison to group II. The difference was statistically significant on MoCA and Rankin Scale ($p < 0.05$).

**Conclusion**

The treatment with neurotrophic factors improves the cognitive and motor performances in patients with lacunar stroke.

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**Adjustment After Stroke Study: investigating the processes and mechanisms that shape social participation following stroke**

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**Introduction:** Many people experience inactivity and social isolation following stroke, which may impact negatively on their mental and physical health. Utilising a cohort of stroke survivors recruited to a UK-wide trial evaluation of a new system of post-discharge stroke care (the LoTS care system of care trial), this study aims to understand the processes and mechanisms that shape social participation post-stroke.

**Methods:** Trial data were screened to identify stroke survivors who were less or more socially active than anticipated (based on pre-stroke and twelve month post-stroke Barthel Index and Frenchay Activities Index scores). Stroke survivors identified were approached to take part in this study. A combination of qualitative methods was used: multiple semi-structured interviews, limited observation, solicited diaries, and ego network and resource mapping techniques. A grounded theory approach to analysis was taken.

**Results:** Twenty-two stroke survivors and ten carers participated in the study. Of the participating stroke survivors, eight were from the less socially active than anticipated group and fourteen were from the more socially active than anticipated group. All participants took part in the interviews, observations and mapping, and thirteen participants kept a diary.

Individual trajectories were produced from the data collected. Analysis enabled the identification and exploration over time of interacting factors that influenced adjustment after stroke. Such factors included: continuation or disruption of previous life, loss of confidence, worry and
anxiety, fatigue.
Conclusion: Findings demonstrate the processes and mechanisms that shape social participation following stroke. This understanding will enable steps to be taken to further support stroke survivors.

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Preoperative risk determinants for cerebral hyperperfusion syndrome following elective carotid artery stenting
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Background and Purpose: Cerebral hyperperfusion syndrome (CHS) is one of the most important complications for carotid artery stenting (CAS). The aim of our retrospective study was to investigate pre-CAS risk determinants for CHS following elective CAS.

Materials and Methods: Included for retrospective analysis were patients 1) who underwent elective CAS for asymptomatic or symptomatic carotid stenosis in our institute from August 2005 to July 2011, 2) whose last ischemic attacks occurred 30 days or more previously from CAS in symptomatic lesions, and 3) in whom CAS was performed successfully. Excluded were patients who underwent CAS for restenosis following previous CAS or CEA. CHS was defined as any symptoms of headache, seizure, hemiparesis, restlessness or delirium which occurred in patients with post-CAS hyperperfusion state (HS) but no additional infarcts on post-CAS CT or MRI. Post-CAS HS was defined as post-CAS increase >10% in ratio of the CBF in the ipsilateral cerebral hemisphere to one in ipsilateral cerebellar hemisphere on single photon emission CT (SPECT) images or post-CAS increase >50% in mean flow velocity of the ipsilateral middle cerebral artery on TCCS. We assessed pre-CAS clinical features, radiological findings, and oral medicine.

Results: Included for our analysis were 186 lesions of 162 cases (mean age 73 ± 6 y.o., 146 men). CHS occurred in 13 patients (7.0%) but no intracranial hemorrhage developed. Degree of stenosis(NASCET %), ratio of the CBF in the ipsilateral cerebral hemisphere to contralateral side on SPECT before CAS, cerebral vasoreactivity (CVR) of CBF in the ipsilateral hemisphere on SPECT, and oral medicine of calcium channel blocker (CCB) and Yokukansan, a traditional Japanese medicine, had significant correlation with CHS. Logistic regression analysis showed severe stenosis (p<0.05), low CVR on SPECT (p<0.05), oral CCB (p<0.05), and no oral Yokukansan (p<0.05) independently correlated with CHS.

Conclusion: Independent risk determinants of CHS following elective CAS were severe carotid stenosis, low CVR on SPECT, and oral medicine of CCB and no Yokukansan.
Optimizing treatment of symptomatic carotid artery stenosis by reducing time delay to intervention – a retrospective sequential observational study from south-western Sweden

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Background: Treatment of symptomatic carotid artery stenosis (SCAS) by endarterectomy or stenting within two weeks is considered as most effective in preventing recurrent ischemic events. Reducing the time from symptom onset to intervention is crucial to improve outcome. Aim of this study was to analyze factors that can reduce the time to intervention.

Methods: We performed a retrospective sequential analysis of 403 patients with 405 procedures due to SCAS. Patients were grouped according to date of intervention between Oct2006-Sept2008 (Group 1) and Oct2008-Oct2010 (Group 2) before and after implementation of a “fast track protocol”. The fast track protocol means that the vascular surgeon was contacted immediately after diagnosis of SCAS and that the patient was not managed by a weekly conference of all involved specialties. Group 2 consisted of a fast track protocol arm and a traditional conference arm. Additionally common stroke risk factors, grade of stenosis, extent of preoperative work-up, in- and outpatient status, recurrent events prior to intervention and corresponding time frames were calculated.

Results: Group 1 consisted of 222 patients and Group 2 of 181 patients. Age, gender, type of presenting event and grade of stenosis did not differ significantly between the two groups. Median time from symptom onset to intervention decreased significantly from 17 to 12 days (p<0,001) while the median time from symptom onset to the first ultrasound examination remained unchanged. 41% had the interventions within two weeks in Group 1 and 57% in Group 2 (p 0,001). Among the 54 fast track protocol patients the median time was 7,5 days with 80% operated within two weeks (p<0,001) but no significant difference in recurrent ischemic events prior to intervention was observed, possibly due to only few occurred events.

Conclusion: Our study shows that by the easy introduction of a fast track protocol time to intervention can be significantly reduced in this high risk group.
Objective. To study the patency of the ipsilateral External Carotid Artery (ECA) following carotid revascularization with Carotid Artery Stenting (CAS) or Carotid Endarterectomy (CEA).

Methods. All patients randomised to CAS or CEA in the International Carotid Stenting Study (ICSS; ISRCTN25337470) in our center were included. Peak systolic velocities (PSV) were assessed with duplex ultrasound (DUS) at baseline, at 30 days after revascularisation, and at 12 and 24 months after randomisation. Primary outcomes were the changes in Duplex Ultrasound (DUS) derived Peak Systolic Velocity PSVmean (ΔPSV(mean)) and the prevalence of ≥ 50% stenosis or occlusion in the ipsilateral ECA during follow-up. ECA stenosis > 50% was defined as PSVmean ECA >125 cm/s. For the present analysis, all patients underwent clinical and DUS follow-up with a minimum of 24 months according to ICSS protocol.

Results. Of 270 patients enrolled in ICSS at our center, 224 patients (mean age, 68.8 years; 154 males) were included in the present study (116 CAS, 108 CEA). Baseline PSVs(mean) in the ipsilateral ECA did not differ between the groups. In patients treated with CAS, PSV gradually increased during follow-up, whereas PSV did not change after CEA; mean difference of PSVmean between CAS and CEA: 23.4 cm/s (95% CI, -4.7 to 51.5), 58.3 cm/s (95% CI, 27.4 to 89.2), and 69.6 cm/s (95% CI, 31.8 to 107.5) at 30 days, 12 months, and 24 months, respectively. One new ECA occlusion occurred after CAS and two after CEA. There was no difference between groups in the occurrence of ECA stenosis ≥50% during follow-up. Conclusion. As measured with DUS, stenosis in the ipsilateral ECA appears to increase after CAS but not after CEA. However, progression of stenosis did not lead to a higher rate of ECA occlusion during the first two years after revascularization.
pared to the pre-procedure baseline.

Results: The mean SFV in ipsilateral middle cerebral artery increased from a basal value of 72.1 cm/s to 76.8 cm/s at 2 hours after intervention (p=.32), 86.4 cm/s on day 1 (p=.054); 88.6 cm/s on day 2; 88.6 cm/s on day 3 (p=.052), and 81.2 cm/s on day 4 (p=.31). The artery flow velocities returned to normal on day 30 (71.7 cm/s). Post-procedure hyperperfusion was observed in two patients at 2 hours and 4 (14.8%) patients on the 1 day. By univariate comparison only diminished cerebrovascular reserve was statistically associated to the development of post-revascularization hyperperfusion (p=.002)

Conclusion: Post-revascularization hyperperfusion can be detected in a substantial proportion of patients after carotid revascularization procedures using TCD. Hemodynamic changes are detected in the first hours after procedure and mainly after the first day. Diminished cerebrovascular reactivity is a risk factor for cerebral hyperperfusion.

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Determinants of cerebral hyperperfusion syndrome after extracranial-intracranial artery bypass in severe intracranial steno-occlusive disease
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Strong correlation was observed between HPS and the grades of pre-operative BHI (0% cases with BHI 0.3-0.69; 6.3% with BHI 0-0.3 and 41% with BHI <0, p=0.012). Patients with HPS showed an increase of more than 50% in the MCA mean flow velocity (compared to pre-operative values) on the operated side (63.3% vs 3.3% on control side, p<0.0005). Meticulous control of blood pressure and hydration led to complete resolution of neurological deficits in all cases (mean 2 days, range 1-6 days).

**CONCLUSION:** Symptomatic cerebral hyperperfusion syndrome is common in the early post-operative period after EC/IC bypass surgery. Early diagnosis and appropriate management help in preventing the complications of this syndrome.

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**A transradial approach for carotid artery stenting**

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[Background] A transfemoral approach is usually used for carotid artery stenting (CAS), but postoperative bed rest is painful to the patient. A transbrachial approach can result in pain in the forearm, sensory disturbance or median nerve palsy due to subcutaneous bleeding. In order to reduce the burden on the patient and mitigate the potential for complications, transradial CAS (TR-
Background and Objective: Self-expanding (positive-remodeling) and neointimalization (negative-remodeling) effects simultaneously influence the hemodynamic changes after carotid artery stenting (CAS). We investigated the relationship of positive and negative remodeling effect on hemodynamic changes developing inside carotid stent through over the 3 years after the carotid intervention.

Methods: We analyzed sonography data of 63 patients, who were underwent successful CAS and regularly followed up carotid sonography at day 1, 6 months, and 1, 2,
and over 3 years after the carotid intervention. Negative remodeling was evaluated by the presence and maximal thickness of neointima at proximal region of carotid stent. Positive remodeling was checked by the stent diameter changes at the three different regions. Finally, the sequential changes of neointimal thickness, stent-diameter changes and hemodynamic parameter, PSV were analyzed at different post-stent period in three stent regions.

Results:
The neointimal thickness was sequentially increased up to 2 years after the intervention, and then, no further increase was observed at over 3 years. The stent diameters at all different stent regions sequentially increased from day 1 through 2 years after the intervention. The diameters of carotid stent were slightly decreased after 3 years. In all proximal, mid-, and distal stent region, PSV subsequently decreased from day 1 to 2 years after carotid stent. Then, the PSV was started to increase after 3 years.

Conclusions:
The present study showed positive remodeling effect is more significantly influenced to the blood flow velocity changes in 2 years after carotid stent. The beneficial positive modeling might be started to decrease after 3 years of carotid stent intervention.
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BACKGROUND: Different stent with varied shapes and materials can be used to perform carotid artery angioplasty (CAS). The self-expanding hybrid stent Cristallo Ideale® (Invatec) is a recent design that consists in a mid-zone closed cell, with open cells at both edges. This shape ensures a better protection in the lesion site and a better adjust to the carotid artery bifurcation.

METHODS: Retrospective review of patients subject to carotid artery angioplasty with implantation of a self-expanding hybrid stent at the Virgen Macarena Hospital from May of 2007 to May of 2011. The collected data includes early major complications (stroke or death by other causes in the 30 days after the procedure), and postprocedural imaging evaluation (MRI with diffusion sequences and Doppler ultrasound).

RESULTS: The data of 92 patients (15 female and 77 male) was analyzed. The patients’ ages were comprised between 53 and 83 years (mean age 70.17 years). Fifty eight post procedural MRIs were
performed. Of those, 20 showed acute ischemic lesions in diffusion sequences, presumably as a consequence of the procedure. No statistically significant difference was found in the presence of acute lesion between the groups that had a proximal or distal protection device. No restenosis were registered during the study. Two patients had hyperperfusion syndrome that resulted in death (2.17%).

No other major complications were registered during this study.

DISCUSSION: European guidelines requires a complication rate less than 6% to performed safe carotid angioplasty. We have a lower rate than this and the same rate than Cristallo registry (2.17%). Our results support the use of hybrid cell stents as a safe alternative in carotid angioplasty, with a complication rate that does not differ significantly from the standard devices. The particular shape of this stent can be the key of this results.

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Long-term clinical outcome following elective percutaneous transluminal balloon angioplasty or stenting based on lesions features of symptomatic intracranial artery disease

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Background and Purpose

SAMMPRIS study has reported that outcome following intracranial stenting is unfavorable. Considering lesions features, intracranial lesions must not always be stented. The aim of our retrospective study is to investigate long-term clinical outcome elective percutaneous transluminal balloon angioplasty (PTCBA) or stenting based on lesions’ features of symptomatic intracranial artery disease.

Methods

Included for retrospective analysis were patients 1) who underwent elective PTCBA or stenting between Jun 2001 and March 2011, and 2) who had a TIA or non-disabling stroke 30 days before PTCBA and/or stenting. Our strategy of PTCBA or stenting was as follows: type A lesion of the middle cerebral artery (MCA), the internal carotid artery (ICA), the basilar artery (BA) or the vertebral artery (VA) was treated with PTCBA alone, type B or C lesion of the ICA with PTCBA or stenting, type B lesion of the BA with stenting, type B or C lesion of the VA with stenting. Evaluated were procedural success rate, complications, angiographic follow-up rate, repeat PTCBA or stenting rate, and long-term clinical outcome.

Results

Sixty-five patients were matched to our criteria. PTCBA was performed in 36 patients and intracranial stenting in 29. There were the MCA lesions in 14 patients, the ICA lesions in 22, the BA lesions in 16 and the VA lesions in 13. The Wingspan system was not used. No reestenosis were registered during the study. Two patients had hyperperfusion syndrome that resulted in death (2.17%). No other major complications were registered during this study.

DISCUSSION: European guidelines requires a complication rate less than 6% to performed safe carotid angioplasty. We have a lower rate than this and the same rate than Cristallo registry (2.17%). Our results support the use of hybrid cell stents as a safe alternative in carotid angioplasty, with a complication rate that does not differ significantly from the standard devices. The particular shape of this stent can be the key of this results.
(90.3%) of sixty-two patients were followed up with conventional angiography between 3 and 12 months and repeat PTCBA or stenting was required in 4 patients (7.1%: 4/56). Ipsilateral stroke occurred in one patient. Cumulative ipsilateral ischemic stroke probability was 4.6% in mean 527 days.

Conclusion
Lesion-specific PTCBA or stenting was safe and able to yield favorable long-term clinical outcome.

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Follow up angiography after recanalization by mechanical thrombectomy in embolic stroke
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Objective: In mechanical thrombectomy retrievers are deployed at the site of the thrombus and pulled back to remove the obstructing clot. Despite high radial forces applied to the vessel wall acute complication rates are apparently low. On the other hand potential long-term side effects of the intimal microtrauma are unknown up to now.

Methods: We reviewed all acute stroke treatments performed within the last 18 month and included patients fulfilling the following criteria: 1) embolic stroke, 2) recanalization without permanent stent placement, 3) follow up angiography available. Final angiographic runs after reopening were assessed for sings of vessel wall irritation or damage. On follow up angiography we analyzed morphological changes compared to the initial angiographic appearance.

Results: Inclusion criteria were fulfilled by 52 of 303 patients harbouring 74 occluded vessel segments. 71 vessels were reopened successfully with a median of 2 (1-8) passages. Devices used were Solitaire AB (n=26), pREset (n=9), BONnet (n=18) and BONnet short (n=14). In 14 patients more than one device was applied. One vessel dissection (1.9%) was uneventfully repaired by stent coverage. Local vasospasm was observed in 28 cases (38%) and was treated pharmacologically in one. Follow up angiography was performed between three and six month after treatment and revealed three de novo stenoses (5.7%) in recanalized vessel segments with a luminal narrowing of 40-70%. Location of stenosis was M1 (n=1) and M2 (n=2). All lesions were clinically asymptomatic, one was treated by stent angioplasty.

Conclusion: Follow up angiography after mechanical thrombectomy demonstrated de novo stenoses at the site of treatment with a frequency of 5.7%. Within this case series all lesions were asymptomatic but the phenomenon should be studied in a larger population to evaluate clinical significance and prognosis.
Background: Carotid Artery Stenting (CAS) has always been considered as a therapeutic option available only at premium centers in big cities. Hospital management and the clinicians are skeptical about the feasibility and safety of the procedure especially in the beginning of the Neurointerventional programme at a peripheral centre. We would like to share our experiences, at Perinthalmanna, a municipality town.

METHODE All symptomatic patients presenting to our neurology department were initially screened by carotid Doppler and the lesions were confirmed by cerebral DSA. Patients with indications for CAS were pooled up and intervention done by an experienced mentor. CAS was done under local anaesthesia.

RESULTS A total of 49 CAS were performed in 48 patients from Sep, 2007 through Aug 2011. There were 17 female and 31 male patients. 1st CAS done in Sep, 2007 after screening >100 patients and 2nd one six months later, then gradually the intervals shortened and the cases increased due to more effective screening and due to the support from neurology community. After the 20 cases performed under proctorship, we started doing independently. First 30-days post CAS outcome analysis, there was no mortality and only 2(4%) patients had minor/major strokes (one was a border zone infarct after 36 hours and other was reperfusion bleed). During long term follow up 1(2%) patient had ipsilateral stroke 2 months after CAS and 2(4%) patients had hemorrhagic stroke at unrelated areas after 1yr. In our observation results of CAS is better than most of the published CEA studies.

DISCUSSION In comparison to previous series there was no periprocedural mortality. Incidence of stroke was nearly equal to the other studies, but there was no major stroke compared to other studies. All the strokes were minor and showed improvement later.

Conclusion: Maintaining the low risk of procedure is the key to development of a viable CAS Program. A well-designed proctorship supported CAS program is the key to the wide reach of CAS in secondary stroke prevention.

CAS can be done with less mortality and morbidity even at peripheral centres.
In the anterior circulation, 27% of the patients had an initial ASPECT score on CT scan or DWI beyond 5, 43% between 5 and 7 and 30% above 7. Endovascular procedure was chosen as the first choice in 51%, “bridging” protocol in 26% and endovascular rescue after intravenous thrombolysis failure in 23%. Retriever device was used in 75% of patients with or without thromboaspiration or intraarterial thrombolysis (IAT). In 25%, we only used aspiration or IAT.

Results: Mean time from onset to recanalisation was 275 minutes and mean time from femoral puncture to recanalisation was 64 minutes. The overall good recanalisation rate (TICI 2b or 3) was 67% among the whole population and 76% in the bridging or rescue sub group. The main per-procedure complication was distal embolism in 25%. In the closed follow-up we experienced 35% of hemorrhagic transformation (PH1, PH2). Median NIHSS at discharge was 5. At three months, favorable outcome (mRS<=2) occurred in 54%, poor in 42% and 4% of patients were dead.

Conclusion: In our center, endovascular treatment for acute ischemic stroke is safe and allow good recanalisation rate in patients with proximal occlusion. Results of multicenter prospective trial are expected to confirm the pivotal role of endovascular therapy in the acute stroke management.
blood flow in excess of 140 ml per minute. In experienced hands there is relatively low morbidity and mortality and an immediately improved augmentation of cerebral blood flow. Long term graft patency rates are acceptable and there are minimal atherosclerotic changes in the vein. In our patient CTA performed one year post-operatively confirmed that the graft was patent. He scored 30/30 on Montreal cognitive assessment (MOCA) and on MMSE when seen 22 months after his surgery.

Conclusions:
Cerebral misery perfusion (CMP) is an important differential diagnosis in patients presenting with symptomatic steno-occlusive carotid disease. Cognitive impairment and strokes are important sequelae of CMP. Carotid revascularisation is a possible therapeutic intervention for prevention or reversal of cognitive impairment and dementia in CMP. Larger studies are needed to identify CMP subgroups that may benefit from EC-IC bypass or endovascular revascularisation. The relative benefit of high-flow over low-flow bypass needs further trials.

Outcomes following intra-arterial treatment for acute ischemic stroke are time-dependent
Rush University Medical Center, Chicago, UNITED STATES

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Outcomes following intra-arterial treatment for acute ischemic stroke are time-dependent
Rush University Medical Center, Chicago, UNITED STATES
Background: We sought to evaluate whether outcomes following intra-arterial therapy (IAT) for acute ischemic stroke (AIS) are time-dependent.

Methods: We analyzed consecutive anterior circulation AIS patients who underwent IAT at our institution from January 2007 to November 2011. We collected demographics, initial NIHSS scores, time of onset and time of reperfusion (if successful), and 30-90 day functional outcomes using the modified Rankin scale (mRS). Thrombolysis in Cerebral Ischemia (TICI) scores were used to grade reperfusion angiographically. We compared in-hospital mortality and 30-90 day mRS among 3 groups (no reperfusion, reperfusion < 6 hour, and reperfusion > 6 hours from onset) using appropriate tests in univariable and multivariable models.

Results: Eighty-four patients (mean age 61.3 years, median NIHSS score 19) with M1/M2 (69%) or ICA-terminus (31%) occlusions were analyzed. Reperfusion (TICI 2 or 3) was achieved in 63.1% with median time to reperfusion of 365 (IQR 324-431) minutes from symptom onset; reperfusion was achieved in < 6 hours in 28.6% and > 6 hours in 34.5%. In-hospital mortality (4.2 vs. 25.8 and 31.0%, P=0.045) was lower and functional independence (mRS 0-2) at 30-90 days was more frequent (41.7 vs. 12.9 and 20.7%, P=0.041) among those with successful early reperfusion compared with those with no or late reperfusion. Early reperfusion was a predictor of functional independence (adj. OR 7.4, 95% CI 2.0-27.7) adjusting for age, baseline NIHSS score, IV tPA administration, and final TICI score.

Conclusions: Our data support a time-dependent relationship between intra-arterial reperfusion and clinical outcomes. Early reperfusion (< 6 hours) is associated with lower mortality and improved functional outcomes compared to late (> 6 hours) or no reperfusion in unselected patients. Further study is warranted to assess time windows and selection criteria for IAT in ischemic stroke.

Figure: Predicted probability of a good outcome (mRS 0-2) at 30-90 days as function of time to reperfusion (black line with red confidence bands). Orange line represents outcome among those who did not achieve angiographic reperfusion.
Results
Normal internal carotid blood flow was successful restored. The authors demonstrate the efficacy of the method in the quantification of carotid flow and show the expected overlapping of the flow curves measured at the common, internal and external carotid arteries, after endarterectomy.

Conclusion
This new method can confirm the success of procedure and helps to exclude complications like immediate carotid thrombosis, residual stenosis, or vessel wall dissection thus promising to be an excellent new tool for this neurovascular procedure. The intraoperative identifications of these complications allow early treatment and might reduce the rate of severe complications of the surgery.

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Manual aspiration thrombectomy through balloon-tipped guide catheter for rapid clot burden reduction in endovascular therapy for ICA L/T occlusion: a technical note
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University of Calgary, Calgary, CANADA

Background
Rapid recanalization is imperative in patients undergoing endovascular therapy for acute ischemic stroke. However patients with extensive clot burden such as carotid T and L occlusions, still may
have a poor outcome from slower recanalization, higher complication rate and non-target embolization. We describe a simple method to allow rapid reduction in clot burden by manual aspiration through a balloon guide catheter placed into the carotid vasculature to allow for subsequent mechanical thrombectomy of the residual occluded middle cerebral artery quickly and safely.

Technique
An 8Fr Balloon-tipped guiding catheter (Concentric Medical, Inc, Mountain View, CA) was prepped and placed in the internal carotid or common carotid artery (based on location of the thrombus) over a suitable curve 5.5Fr catheter (slip-cath, Cook Medical, Bloomington, IN) and a 0.035” angled tip hydrophilic guidewire (Terumo Medical Corporation, Somerset, NJ). The balloon was inflated to the recommended volume and manual aspiration was performed through a rotating hemostatic valve for approximately 5-10 seconds (Fig. 1).

Results
Four patients (three male, mean age 69.25) with severe strokes (mean NIH stroke scale score 16) and early CT scans (CT ASPECTS score median 8) had this technique performed as a first step towards definitive endovascular treatment. Significant angiographic clot burden reduction was achieved in all patients with the aspiration technique who then subsequently underwent mechanical thrombectomy with an appropriate device. No complication from the aspiration component of the procedure was seen. The mean 24 hr NIHSS was 6 and the discharge mRS was 2.

Conclusion
Manual aspiration using a 60cc syringe through a balloon guide catheter placed in the cervical carotid artery is a safe technique and when successful, results in rapid reduction in clot burden in terminal carotid occlusions allowing for subsequent therapy with a suitable mechanical device.

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EIFICACY OF STENTING IN SUB-OCCULSIVE LESIONS OF INTERNAL CAROTID ARTERY
S. EICHAU MADUEÑO¹, S. PEREZ SANCHEZ², M.A. GAMERO GARCIA³, V. SANCHEZ SANCHEZ⁴, C. CARRASCOSA ROSILLO⁵, G. IZQUIERDO AYUSO⁶, R.J. RUIZ SALMERON⁷
Virgen Macarena University Hospital, Seville, SPAIN¹, Virgen Macarena University Hospital, Seville, SPAIN², Virgen Macarena University Hospital, Seville, SPAIN³, Royal London Hospital. Barts and the London NHS trust., London, UNITED KINGDOM⁴, Virgen Macarena University Hospital, Seville, SPAIN⁵,
**BACKGROUND:** In symptomatic patients, the presence of subocclusive lesions is associated with risk of carotid occlusion and early major stroke. The management of these lesions is a matter of controversy. Angioplasty is one of the possible treatments. We collected the data and analysed the efficacy of this procedure in our hospital.

**METHODS:** We collected the data of patients who underwent carotid angioplasty at Virgen Macarena Hospital between January of 2008 and December of 2011. We considered lesions that had an arterial diameter of less than 1 mm measured by arteriography to be subocclusive. We registered data of carotid lesions and patients’ characteristics (age, sex, vascular risk factor and prior stroke). We also registered major clinical events (major strokes and death by any cause) in the 30 days after the procedure.

**RESULTS:** We analyzed the data of 185 patients. Fifty-seven of them (30.8%) had subocclusive lesions. Of those, 43 (75%) were symptomatic. Vascular risk factors were as follows: smoking (35%); hypertension (71.9%), dyslipemia (80.7%), diabetes (43.8%) and prior stroke (43.8%). The success rate of the procedure was 96.5%. There were 3 major events (5.17%), all resulting in death because of a hyperperfusion syndrome in all of them. Protection devices were used in all patients.

**DISCUSSION:** These results support the use of angioplasty for revascularization on subocclusive carotid lesions. Pay attention to influential factors that can develop a hyperperfusion syndrome is important to avoid this fatal complication due to carotid revascularization.

**TYPE OF STENT, PROTECTION DEVICES AND ACUTE LESIONS IN DIFUSION AFTER CAROTID ARTERY ANGIOPLASTY**

S. PEREZ SANCHEZ¹, S. EICHAU MADUEÑO², M.A. GAMERO GARCIA³, V. SANCHEZ SANCHEZ⁴, C. CARRASCOSA ROSILLO⁵, G. IZQUIERDO AYUSO⁶, R.J. RUIZ SALMERON⁷

Virgen Macarena University Hospital, Seville, SPAIN¹, Virgen Macarena University Hospital, Seville, SPAIN², Virgen Macarena University Hospital, Seville, SPAIN³, Royal London Hospital. Barts and the London NHS trust., London, UNITED KINGDOM⁴, Virgen Macarena University Hospital, Seville, SPAIN⁵, Virgen Macarena University Hospital Seville,SPAIN⁶, Virgen Macarena University Hospital, Seville, SPAIN⁷

**BACKGROUND:** Angioplasty has become one of the most frequently used treatments for carotid stenosis in the last few years. One of its disadvantages in the incidence of distal embolisms induced by therapeutic manipulation of the plaque. Still, these embolisms are usually asymptomatic and can only be detected by neuroimaging. Many different protection devices have been designed to
reduce the incidence of this events, with different mechanisms. Our purpose is to analyze the differences in effectiveness between these devices.

METHODS: Data from a series of carotid angioplasties performed in the Virgen Macarena Hospital in Seville between 2007 and 2011 were analyzed. Groups were made depending on the type of stent and protection device used. The data analysed included presence of acute lesions in postprocedural diffusion MRI sequences (performed 10 days after the procedure).

RESULTS: We revised the data from total of 230 patients (39 female, 191 male) with a mean of age of 69.43 years. MRI with diffusion sequences were performed in 144 patients of which 48 had acute lesions (33.3%). A proximal protection device (MOMA ®) had been used in 11 of these patients, while a distal protection device had been used in 29. The types of stents used were Acculink ® (18.75%), Cristallo ® (32%), Precise ® (35.48%) and Protege ® (39.39%). No statistically significant difference was found in the incidence of distal embolism between the different protection devices nor different stents used in our centre.

DISCUSSION: Our results show no difference in incidence of distal embolism in carotid artery angioplasty when using some of the diverse protection devices and stents available in the market.
Hyperacute Ischemic Stroke Patients
D.H. Kim¹, S.H. Ahn², D.U. Kim³, I.S. Choo⁴, J.H. Oh⁵
Departement of Radiology, Chosun University College of Medicine, Gwangju, SOUTH KOREA¹, Departemtn of Neurolgy, Chosun University College of Medicine, Gwangju, SOUTH KOREA², Departemtn of Neurology, Chosun University College of Medicine, Gwangju, SOUTH KOREA³, Departemtn of Neurology, Chosun University College of Medicine, Gwangju, SOUTH KOREA⁴, Departemtn of Radiology, Chosun University College of Medicine, Gwangju, SOUTH KOREA⁵

Background: To compare the feasibility and results of aspiration thrombolysis using reperfusion catheter of the Penumbra system (PS) with mechanical thrombolyis with pigtail-shaped microwire for the treatment of hyperacute ischemic stroke.

Methods: Sixty nine consecutive patients (A group) within 6 hours from symptom onset, during a period of 24 months (Oct 2007 – Nov 2009) were treated by a standardized protocol using pigtail-shaped microwire for mechanical thrombus disruption. Thereafter, fifty six consecutive patients (B group) within 6 hours from symptom onset, during a period of 24 months (Dec 2009 – Dec 2011) were treated by reperfusion catheter of the PS without the separator for thrombus aspiration in a stroke center. The location of occlusions, TIMI score, post-thrombolysis hemorrhage or malignant edema and clinical outcome (initial NIHSS, 3-month mRS) in two groups were evaluated, respectively.

Results: In A group, cerebral angiography due mainly to vessel tortuosity. There were 9 deaths (4.8%) in the 30-day periprocedural period. 17 (9.0%) patients died, suffered a stroke or myocardial infarction in the 30-day periprocedural period. There are more serious complications in the symptomatic (n=14, 11.3%) compared to the asymptomatic group (n=3, 5.0%), however this difference was not statistically significant (p=0.2763).

Conclusion
CAS performed at our centre is a safe and dependable method of carotid revascularization. Outcomes are in line with other international trials, and allow for CAS to be offered as an alternative to CEA.

Table 1. Patient demographics, symptoms and risk factors

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>All</th>
<th>Symptomatic</th>
<th>Asymptomatic</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male number of patients (%)</td>
<td>124 (62.9%)</td>
<td>64 (52.8%)</td>
<td>60 (47.2%)</td>
<td>0.2334</td>
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<tr>
<td>Female number of patients (%)</td>
<td>72 (37.1%)</td>
<td>44 (35.2%)</td>
<td>28 (23.8%)</td>
<td></td>
</tr>
<tr>
<td>Total number of patients (%)</td>
<td>296</td>
<td>108</td>
<td>188</td>
<td></td>
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<tr>
<td>Age years</td>
<td>Average</td>
<td>69.75 ± 8.11</td>
<td>69.79 ± 8.48</td>
<td>69.74 ± 8.15</td>
</tr>
<tr>
<td>Minimum</td>
<td>40</td>
<td>40</td>
<td>51</td>
<td></td>
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<tr>
<td>Maximum</td>
<td>84</td>
<td>79</td>
<td>85</td>
<td></td>
</tr>
<tr>
<td>Symptomatic number of patients (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electro</td>
<td>40 (16.3%)</td>
<td>0</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>TIA</td>
<td>35 (13.2%)</td>
<td>19</td>
<td>16</td>
<td></td>
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<tr>
<td>Amnestic aura</td>
<td>33 (12.5%)</td>
<td>15</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Ischemic transients</td>
<td>56 (21.7%)</td>
<td>30</td>
<td>26</td>
<td></td>
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<tr>
<td>Diabetics</td>
<td>7 (2.8%)</td>
<td>0</td>
<td>7</td>
<td></td>
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<tr>
<td>Cardiovascular symptoms</td>
<td>21 (7.8%)</td>
<td>6</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>MI stroke</td>
<td>7 (2.8%)</td>
<td>0</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>PT</td>
<td>21 (7.8%)</td>
<td>10</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>GCS</td>
<td>5 (1.8%)</td>
<td>2</td>
<td>3</td>
<td></td>
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<tr>
<td>Ischemic/infarct &lt;3 months</td>
<td>9 (3.3%)</td>
<td>0</td>
<td>9</td>
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<tr>
<td>Diabetes</td>
<td>5 (1.8%)</td>
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<td>5</td>
<td></td>
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<tr>
<td>Acute stroke</td>
<td>4 (1.5%)</td>
<td>0</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Risk factors number of patients (%)</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypertension</td>
<td>69 (23.7%)</td>
<td>66 (53.6%)</td>
<td>3 (2.3%)</td>
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<tr>
<td>Hypothyroidism</td>
<td>27 (9.5%)</td>
<td>17 (13.9%)</td>
<td>10 (8.4%)</td>
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</tr>
<tr>
<td>Acute</td>
<td>24 (8.3%)</td>
<td>20 (16.3%)</td>
<td>4 (3.3%)</td>
<td>0.5532</td>
</tr>
<tr>
<td>Previous CVA</td>
<td>60 (20.5%)</td>
<td>32 (25.9%)</td>
<td>28 (23.5%)</td>
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</tr>
<tr>
<td>Current cardiac reasons</td>
<td>98 (33.4%)</td>
<td>27 (22.1%)</td>
<td>71 (58.9%)</td>
<td>0.0403</td>
</tr>
<tr>
<td>Previous CVA</td>
<td>13 (4.4%)</td>
<td>2 (1.6%)</td>
<td>11 (9.0%)</td>
<td>0.009</td>
</tr>
<tr>
<td>Previous CVA</td>
<td>13 (4.4%)</td>
<td>10 (7.9%)</td>
<td>3 (2.4%)</td>
<td>0.3493</td>
</tr>
<tr>
<td>History of smoking</td>
<td>62 (12.6%)</td>
<td>44 (34.7%)</td>
<td>18 (29.3%)</td>
<td>0.0210</td>
</tr>
<tr>
<td>Raised GFR</td>
<td>2 (0.8%)</td>
<td>2 (0.8%)</td>
<td>0 (0.0%)</td>
<td>1</td>
</tr>
<tr>
<td>NIHSS/NIHSS</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0</td>
</tr>
</tbody>
</table>

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Comparison between Aspiration Thrombolysis with Reperfusion Catheter of the Penumbra system and Mechanical Thrombolysis with pigtail-shaped Microwire for Treatment of
Use of intraoperative indocianine green videoangiography quantitative flow assessment in EC-IC cerebral bypass surgery.

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**Background**

Indocianine green videoangiography (ICGV) allows an intra-operative assessment of vessel patency with a recent widespread use in neurovascular surgery. The new microscope based integrated flow analyses software allows a quantitative intraoperative analysis of the cerebral blood flow. In EC-IC by-pass surgeries it allows baseline cerebral flow assessment in order to choose the number and flow capacity of the donor vessels.

The authors report its use in the surgical management of a patient with a cerebral hypoperfusion syndrome.

**Methods**

A 72-year-old man presented with recurrent TIA of the left cerebral hemisphere associated with physical activity and hypotension. Cerebral angiography showed left ICA total occlusion and poor vascular left cortical supply. Perfusion MRI studies confirmed the asymmetric cerebral flow. A reperfusion EC-IC by-pass surgery was proposed. Intraoperative ICGV was performed, though a Carl-Zeiss Pentero surgical microscope, equipped with the flow analysis software.

**Results**

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**Use of intraoperative indocianine green videoangiography quantitative**
Intraoperative left cerebral cortex flow map was obtained. A superficial temporal artery end-to-side anastomose into a frontal cortical left middle cerebral artery branch was performed. Post by-pass flow analysis confirmed overall relative cortical flow improvement. Twelve hours after the procedure patient became drowsy and aphasic. CT scan was normal and a surgical by-pass revision performed. The ICGV flow map showed by-pass patency and generalized vasospasm. Topical papaverin was administered with improvement of the blood flow. Vasospasm hyperdinamic therapy was then administered with progressive neurologic improvement.

Conclusion
Intraoperative flow analysis is a useful tool in the management of EC-IC by-pass surgeries. It can be used to assess the number and caliber of donor vessels; confirm patency of the anastomose; quantify the improvement of cerebral blood flow and assess efficacy of intraoperative therapeutical measures.

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Aspirin and clopidogrel resistance in carotid angioplasty and stenting (CAS).
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Hospital Universitario Virgen del Rocio, Seville, SPAIN

Background:
Antiplatelet therapy is critical to stenting procedures but some patients are resistant to aspirin and clopidogrel. We aimed to monitor platelet function in a single-center cohort undergoing CAS.

Methods:
We prospectively included patients from July 2010 to December 2011. Patients were premedicated with aspirin (100mg) and clopidogrel (75mg) for 7 days before procedure or a loading dose of clopidogrel (450mg) and aspirin (500mg) at least 2 days before CAS was given. We used the VerifyNow systems at baseline and on day 30 after CAS to calculate aspirin reaction units (ARU) and for clopidogrel function assessment, platelet reactivity units (PRUs) and percentage platelet inhibition were measured. Clopidogrel-resistant patients received 75 or 150mg daily in a 1:1 ratio for one month after CAS.

Results:
111 consecutive CAS patients were included, with a mean age of 66,9 years and 72% were men. Mean stenosis was 88% and 70% were symptomatic. At baseline, 12 patients (11%) were aspirin non-responders (ARU>550) and 47 patients (42%) were clopidogrel-resistant (&#844;17% inhibition). No significant differences in morbidity and mortality were observed between responders and resistant patients. At one month after CAS, similar rates of aspirin-resistance were found. 50% of clopidogrel non-responder patients at 75mg clopidogrel dose were still resistant while 30% of those at 150mg dose were resistant at one month (p=0.191). Only 6,8% of previous clopidogrel responders were resistant at 30 days.
Vascular surgery and neurosurgery/ interventional neuroradiology

RISK FACTORS OF EARLY CEREBRAL COMPLICATIONS AFTER CAROTID STENTING IN PATIENTS WITH MULTIPLE OCCLUSIVE ATHEROSCLEROTIC LESIONS OF BRACHIOCEFALIC ARTERIES
Research Center of Neurology RAMS, Moscow, RUSSIAN FEDERATION

Background: Multiple occlusive atherosclerotic lesion of brachiocephalic arteries (BCA) may increase risk of postoperative complications. We aimed to study cerebral complications after carotid artery stenting (CAS) in these patients.

Methods: We investigated 63 patients (47 male; mean age 61+/−9 years). Previously stroke was diagnosed in 50% pts, myocardial infarction (MI) – in 27%, congestive heart failure (CHF) - in 37%, intermittent claudicating (IC) – in 17% ones. High grade stenosis (>70%) of one from BCA was revealed in 31% pts, 2 arteries – in 40%, 3 arteries – in 21% and 4 arteries – in 8% pts. To reveal post-procedural silent ischemic brain lesions (PSIBL) DWI was performed before and at 1-2 days after CAS. Variability of BP was assessed by 24-hour ambulatory monitoring as SD of day-time and nocturnal systolic and diastolic BP. CAS was carried out using accident protection devices. For 1 month after CAS cerebral events were recorded.

Results: At 30 days after CAS cerebral complications were recorded in 5 (8%) pts (TIA - 2, minor stroke – 3) and PSIBL were revealed in 21 (33%) pts. Cerebral disorders were associated with previous MI, CHF, IC (p<0,05) and no depended on number of occlusive BCA. Patients with postoperative TIA, stroke and PSIBL had significantly (p<0,05) increased triglycerides (TG) and reduced HDL-C plasma levels and elevated day-time SBP variability as against other patients: 1,8 mmol/l (1,3;2,7) vs 1,5 mmol/l (1,2; 1,7), 1,3 mmol/l (1,1;1,5) vs 1,6 mmol/l (1,4;1,8) and 15,3 mm Hg (13;17) vs 12 mm Hg (10;15) respectively.

Conclusion: Thus, in patients with multiple occlusive atherosclerotic lesions of BCA risk factors of early cerebral lesions after CAS are previous MI, CHF, IC, increased TG, reduced HDL-C plasma levels and elevated SBP day-time variability.
EMERGENT ENDOVASCULAR RECANALIZATION AND STENTING OF INTERNAL CAROTID ARTERY IN ACUTE ISCHEMIC STROKE PATIENTS

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Background: Acute stroke due to internal carotid artery (ICA) occlusion or severe stenosis is usually associated with poor prognosis. An effective therapeutic approach has not been definitively established yet. The aim of our study was to evaluate the feasibility, safety, and efficacy of emergent ICA stenting.

Methods: We reviewed the clinical files of acute stroke patients (less than 6 hours of symptoms) admitted to our stroke unit from April 2007 to December 2011 with ICA occlusion or severe stenosis treated with emergent stenting. We evaluated clinical and neuroradiological characteristics, namely gender, age, National Institute of Health Stroke Scale (NIHSS) score on admittance, type of occlusion and recanalization rates, as well as complications and clinical outcomes, ie, NIHSS score at 7 days, Modified Rankin Scale (mRS) score and death rate at 30 days.

Results: Seventeen patients were identified (13 men and 4 women; median age 62-years-old) Complete ICA recanalization was achieved in all patients. Intracranial arteries occlusions were found in 13 patients. Using mechanical devices we achieved a recanalization rate (grade 2 or 3) of 85%. Median NIHSS scores before stenting and at 7 days were 19 and 8, respectively, showing neurological improvement (p<0.05, Wilcoxon rank sum test). Three patients had symptomatic post procedure intracranial hemorrhage. Three patients had asymptomatic intracranial hemorrhage detected during CT/MRI controls. Other major complications included one disabling contralateral stroke and 2 patients with congestive heart failure requiring ventilatory support. Ten patients (58.8%) had an mRS score equal or inferior to 3 at 30 days. Three patients died in the first 30 days.

Conclusions: Emergent ICA recanalization by using carotid stenting seems to be a safe and feasible procedure. It may improve the 7-day neurological outcome.
and the 30-day functional outcome in patients with acute ischemic stroke and severe carotid stenosis or occlusion.

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Aspiration Thrombolysis with Reperfusion Catheter of the Penumbra system and Adjuvant Intraarterial Urokinase for Treatment of Hyperacute Ischemic Stroke Patients
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Background: To assess the feasibility and results of aspiration thrombolysis using reperfusion catheter of the Penumbra system without the separator for the treatment of hyperacute ischemic stroke.

Methods: Fifty six consecutive patients within 6 hours from symptom onset, during a period of 25 months (Dec 2009 – Dec 2011), treated by a standardized protocol using the reperfusion catheter of the Penumbra system without the separator for thrombus aspiration were reviewed. The coaxial system, which was assembled by a reperfusion catheter of penumbra system and a 1.4F microcatheter, was advanced into occluded vessel. The tip of the reperfusion catheter was embedded within the proximal end of the thrombus to wedge the catheter with the clot. Thereafter, the reperfusion catheter was withdrawn for connected a 10-ml syringe to the its proximal hub and maintaining the pulling forces. The location of occlusions, Thrombolysis in Myocardial Infarction (TIMI) score, post-thrombolysis hemorrhage or malignant edema and clinical outcome (initial NIHSS, 3-month mRS) were evaluated.

Results: Cerebral angiography demonstrated occlusions of the proximal internal carotid artery in 14 patients, the distal internal carotid artery in 6 patients, the proximal middle cerebral artery in 11 patients, the distal middle cerebral artery in 14 patients and the vertebrobasilar artery in 7 patients. One patient who had rapid reocclusion following stent-assisted angioplasty for thrombotic occlusion of MCA M1 segment received IV abciximab. The mean UK dose was 180,000 IU. The Thrombolysis in Myocardial Infarction (TIMI) grade 2 or 3 was observed in 48 patients (48/56, 85%). Symptomatic intracranial hemorrhage was developed in five patients (5/56) and malignant edema was presented in one patient (1/56). The median initial NIHSS scores showed 16(range 2-39). At three months, good outcome was noted in 18 of 48 patients (37%, mRS 0–2).

Conclusion: Mechanical thrombolysis using aspiration thrombolysis using reperfusion catheter of the Penumbra system with adjuvant intraarterial urokinase...
is safe and effective in achieving recanalization with good long-term outcome.

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Acute and 90 Day Outcomes in Acute Ischemic Stroke - A Retrospective Single Center Experience of 152 Patients treated with Stentriever™ Technology, Merci® and Intra-Arterial rt-PA

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Background: Interventional treatment of acute stroke results in better recanalization and good clinical outcomes for selected patients. The MERCI and MultiMERCI Studies studied the first mechanical thrombectomy device: the Merci retriever. Newer devices such as Trevo® and Solitaire® are stent-like devices used for mechanical thrombectomy. Each has been studied in trials and registries. This is a “real world” analysis of how these technologies are employed in clinical practice.

Methods: Retrospective analysis of 152 consecutive interventional cases where IA tPA, Merci, Penumbra, Solitaire and the Trevo system were employed, between January 2010/September 2011. General inclusion criteria were NIHSS>10 or CTA showing large vessel occlusion; Age>18; Time from symptoms<8h. Patients with hemorrhage on CT at admission, acute lesion>1/3 of MCA territory; glucose<50 />400, platelets<100000, SBP>185 and/or DBP>110 were excluded. If there was no contraindication, IV tPA 0.6mg/kg was administered before procedure, according to our Stroke Unite protocol; If possible, intervention was performed under sedation only.

Results: Median age was 63.8 ± 14.6, and median NIHSS was 18 (Q1-Q3:15-22). Time from symptom onset was 201±172 (Mean ± SD) minutes. Occlusion locations were: proximal ICA=19(12%); ICA-T=39(26%); MCA=71(48%); ACA=3(2%); Vertebrobasilar=18(12%). High revascularization results were achieved with a total of 85.6% of patients with a TICI>2 (45.4% TICI2, 40.1% TICI3). Clinical results showed a shift from the median baseline NIHSS=18 to median NIHSS at discharge=10 (P<0.05). Analysis is on-going for mRS, but 108 patients have been followed to the 90 day endpoint. At discharge, 29.9% of patients had mRS<2, for those currently followed at 90 days, 40.8% had mRS<2. A comparison of mechanical thrombectomy modalities of Merci® (n=42) and Trevo® (n=50) was also done (see table).

Conclusions: High revascularization rates and good clinical outcomes can be achieved with interventional techniques, especially with mechanical thrombectomy. In our experience, the use of the newest stentriever technology has brought a significant improvement in revascularization rates, clinical outcomes and shorter procedural times.
21. European Stroke Conference
Scientific Programme

<table>
<thead>
<tr>
<th></th>
<th>Merci (n=42)</th>
<th>Trevo (n=50)</th>
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</thead>
<tbody>
<tr>
<td>Number of Passes (median)</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Recanalization with 1 pass</td>
<td>14%</td>
<td>28%</td>
</tr>
<tr>
<td>TICI ≥ 2</td>
<td>78.5%</td>
<td>96%</td>
</tr>
<tr>
<td>TICI 3</td>
<td>33%</td>
<td>48%</td>
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<tr>
<td>Duration of procedure (minutes)</td>
<td>102.9 ± 48.2</td>
<td>77.6 ± 42.4</td>
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</tbody>
</table>

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External carotid-internal carotid (EC/IC) bypass surgery improves hemodynamic parameters and cognitive performance in patients with severe intracranial steno-occlusive disease

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Introduction: Patients with intracranial stenoses are at considerable risk for recurrent ischemic events. Recently published trials on intracranial stenting and external carotid-internal carotid (EC/IC) bypass in carotid occlusions failed to show benefit over best medical therapy despite improving cerebral hemodynamics. We evaluated whether the improved cerebral vasodilatory reserve (CVR) after EC/IC bypass for severe steno-occlusive disease of intracranial internal carotid (ICA) or middle cerebral artery (MCA) influenced various cognitive parameters.

Methods: Patients with severe steno-occlusive disease of ICA or MCA and impaired CVR on transcranial Doppler (TCD) breath-holding index (BHI) were evaluated with acetazolamide-challenged HMPAO-SPECT imaging. Patients with significantly impaired CVR on SPECT were offered STA-MCA bypass surgery. TCD-BHI, SPECT-CVR and cognitive performance using formal neuropsychological battery were performed at baseline and re-evaluated at 6 months after surgery.

Results: Of the 112 patients with severe intracranial ICA/MCA stenosis, 77 (69%) showed impaired CVR and 46 (41%) underwent STA-MCA bypass. Significant improvements were noted in CVR: TCD-BHI in affected MCA improved from a median 0 (IQR 0.45) to 1.10 (IQR 0.73), p< 0.001 and as well as SPECT (P< 0.001). 9 patients underwent formal neuropsychological evaluation before and after EC-IC bypass surgery. Compared to the controls (n=7), considerably significant within improvements were noted in animal fluency (3±3, p=0.002 vs 0.6±4.2, p>0.05), picture immediate recall (1.4±0.9, p=0.01 vs 0.6±1.5 p>0.05) and delayed recall (1.3±1.1, p=0.007 vs -0.1±2.3 p>0.05). Patients undergoing surgery had borderline significant improvement than the controls in block design (4.1±5.4, p=0.052 vs 3.2±10.6, p>0.05). Significant reduction in the number of ischemic events was observed in the surgical group (11% vs 45% in medical group; p<0.005) during median 21 months
The clinical presentation of Spinal Dural Arteriovenous Fistula

OBJECTIVES
The clinical diagnosis of spinal dural arteriovenous fistula SDAVF is difficult because presenting symptoms and signs can be similar to those seen with spinal canal stenosis or peripheral nerve or root disorders. The aim of our study was to assess the symptoms, neurological signs, and radiological findings in a large series of patients with myelopathy due to SDAVF.

METHODS
We reviewed 153 consecutive patients with SDAVF treated surgically at our institution between 1995 and 2008. Before surgery, all patients had detailed neurological examination, 147 patients had spinal MRI and all had spinal angiography. We evaluated associations between symptoms, physical signs, spinal cord T2 signal abnormality on MRI, and fistula level on angiogram.

RESULTS
Mean age was 63.5 years and 119 (77.8%) were men. Presenting symptoms included leg weakness (74 patients, 48.4%), leg sensory disturbances (41 patients, 26.8%), pain involving back or legs (31 patients, 20.3%), and sphincter disturbances (6 patients, 3.9%). Worsening weakness with exertion was present in 66 (43.1%) patients and correlated with thoracic fistula location (p=0.04). Pinprick level was identified in 57 (37.3%) patients; L1 level (22.8%) was the most common, followed by T10 (19.3%). Fistula level (± two levels) corresponded to pinprick level in only 40% of these patients. Highest cord level of T2 signal hyperintensity (± two levels) corresponded to pinprick level in 25% of cases.

CONCLUSIONS
Leg weakness exacerbated by exercise, likely due to worsening hypertension in the arterialized draining vein, is a common manifestation of thoracic SDAVF. Although a sensory level is often found, it cannot reliably guide the level of imaging. Thus, the entire spine should be examined with MRI when a SDAVF is suspected.

Conclusion: EC/IC bypass surgery in carefully selected patients results in significant improvement in their cerebral hemodynamics measures and cognitive performance, especially the executive function and visual memory.

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The Clinical and Radiological Presentation of Spinal Dural Arteriovenous Fistula

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Leg weakness exacerbated by exercise, likely due to worsening hypertension in the arterialized draining vein, is a common manifestation of thoracic SDAVF. Although a sensory level is often found, it cannot reliably guide the level of imaging. Thus, the entire spine should be examined with MRI when a SDAVF is suspected.
Clinical and Angiographic Outcomes following Balloon Angioplasty and Stenting of Venous Sinus Occlusion Coupled with Dural Arteriovenous Fistulas

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[Purpose] The purpose of our retrospective study is to investigate the feasibility, safety, effectiveness and outcome of balloon angioplasty and stenting of venous sinus occlusion coupled with dural arteriovenous fistulas (DAVFs).

[Method] Inclusion criteria for analysis were patients (1) who were admitted to our institution from January 2008 to December 2011, (2) who presented some neurological symptoms, (3) with venous sinus occlusion coupled with DAVFs displayed on angiograms, (4) who underwent balloon angioplasty and/or stenting of venous sinus occlusion. Procedural success, complications, clinical symptoms, 3-months angiographic and clinical outcomes were investigated.

[Result] During the study period, seven patients were included for retrospective analysis. Cerebral angiography showed the transverse-sigmoid (T-S) sinus occlusion in five cases and inferior petrous sinus (IPS) occlusion in two cases. Venous sinus stenting was performed in six cases and balloon angioplasty alone in one case, and venous sinus occlusion was recanalized successfully in 7 cases. Successful recanalization immediately diminished reflux into cerebral cortical or deep veins from venous sinus and venous sinuses drained antegradely into the internal jugular vein and neurological symptoms were improved. Procedural complications occurred in one case (intracranial hemorrhage). In the other six cases, no neurological symptoms have recurred for 3 months after procedures, and they underwent follow-up angiogram at 3 months, demonstrating that stent thrombosis and retrograde drainage into cerebral veins recurred in three cases and sinuses remained to drain antegradely in three cases.

[Conclusion] Successful balloon angioplasty and/or stenting of venous sinus occlusion coupled with DAVFs normalized cerebral venous drainage and improved neurological symptoms immediately. However, stent thrombosis and persistent retrograde drainage may limit long-term clinical outcomes.

Ipsilateral foetal-type posterior cerebral artery is associated with cognitive decline after carotid revascularization

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Background:
In patients with an ipsilateral foetal-type posterior cerebral artery (FTP), a stenosis of the internal carotid artery (ICA) is likely to result in a larger area with hypoperfusion than in case of a normal posterior cerebral artery (PCA). We hypothesized that patients with an FTP would benefit more from carotid revascularization than patients with a normal variant. Therefore, we compared the effects of carotid revascularization on cognition between patients with an ipsilateral FTP and those with a normal PCA.

Methods:
Patients with symptomatic carotid artery stenosis > 50%, enrolled in the International Carotid Stenting Study (ICSS; ISRCTN25337470) at the University Medical Center Utrecht (UMCU), the Netherlands, underwent detailed neuropsychological examinations (NPE) before and 6 months after revascularization. Cognitive test results were standardized into z scores, from which a cognitive sumscore was calculated. The primary outcome was the change in cognitive sumscore between baseline and follow-up. Changes in cognitive sumscore were compared between patients with an ipsilateral FTP and those with a normal PCA, as assessed with CT or MR angiography.

Results:
Of the 145 patients enrolled in ICSS at the UMCU during the study period, 98 had angiography at baseline and NPE at baseline and at 6-months follow-up. The cognitive sum score decreased by 0.28 (95% confidence interval (CI), -0.45 to -0.10) in the 13 patients with an FTP and by 0.07 (95% CI, -0.15 to -0.002) in the 85 with a normal PCA: mean difference, -0.20; 95% CI, -0.40 to -0.01. This did not change essentially after adjustment for baseline factors.

Conclusion:
The larger cognitive decline after carotid revascularization in patients with an ipsilateral FTP than in those with a normal PCA is unanticipated but might be explained by more frequent ‘silent’ cerebral ischaemia in the flow territory of the PCA, which includes the thalamus and the mesial temporal lobe. This finding needs further study.
Background: Recent studies have suggested that Endovascular Therapy (ET) might be effective and safe in selected patients with acute ischemic stroke of unknown onset (UO) or beyond time window (BTW). Our aim is to describe our experience with ET in those situations.

Methods: We considered BTW stroke if onset-to-treatment time > 8h in anterior circulation, and > 24 hours in posterior circulation strokes. Patients’ selection for ET was based on CT perfusion criteria and/or absence of an established cerebral infarction on plain CT. We analyzed recanalization rate, functional status (measured by modified Rankin Scale (mRS) at 3 months), hemorrhagic transformation and mortality.

Results: From December 2007 to May 2011, 28 patients were treated with ET in our institution. In 10 cases time of onset of stroke was unknown or BTW. 8 cases suffered an anterior circulation stroke. 4 patients woke-up with the symptoms and in the other 6 patients treatment delay was related to other causes. Baseline NIHSS score was 14 (SD: 4.4). Complete recanalization was achieved in seven patients. Two patients had an asymptomatic hemorrhagic transformation (no symptomatic hemorrhage occurred). Three patients scored 0 to 2 in mRS at 3 months. Two patients died.

Conclusions: In carefully selected patients, endovascular therapy may be applied with reasonable levels of effectiveness and safety in case of ischemic strokes of unknown onset or beyond time window.

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Pre- and posttreatment hemorrhage rates of brain arteriovenous malformations treated with radiosurgery.

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Background and Purpose: Several endovascular revascularization strategies have been described for the treatment of acute ischemic stroke (AIS). One of them is stenting when a very narrow stenosis with high reocclusion risk remains after recanalization. This study describes the risk of symptomatic intracerebral hemorrhage (SICH) after emergent stenting in patients with AIS treated with endovascular therapies (EVT).

Methods: Consecutive patients who un-

Background and Purpose: the long-term benefit of radiosurgery of brain arteriovenous malformations (AVM) is controversial. We calculated hemorrhage rates pre and post treatment and analyzed the risk factors for bleeding.

Methods: 108 patients, age 36+/−17 years, 56 men. The median follow up was 54 months. Most AVM were less than 3 cm in diameter (74.1%), 48.1% were located in an eloquent area, 27.8% had deep drainage, 39.8% had presented with hemorrhage.

Results: annual pretreatment hemorrhage rate for hemorrhagic AVM was 3.3%. Older patients, cortical or subcortical AVMs and cases with multiple draining veins were less likely to present with bleeding. During the first 36 months post-radiosurgery, hemorrhagic AVM had a bleeding rate of 2.1%, and non-hemorrhagic AVM of 1.4%. From 3 years onwards, hemorrhagic cases had a 1.1% and non-hemorrhagic cases 0.3% bleeding rate. Arterial hypertension and nidus volume were independent predictors of bleeding after treatment. Obliterated AVM had a 0.6% hemorrhage rate after confirmation of nidus closure.

Conclusions: Both hemorrhagic and non-hemorrhagic irradiated AVMs present a gradual decrease in their bleeding rates over the years. Nonetheless, the risk of hemorrhage persists during the entirety of follow up, even for obliterated AVM.
Background – In patients with internal carotid artery (ICA) stenosis, the circle of Willis (CoW) is the primary collateral pathway. We compared luminal diameters in the CoW before and after carotid revascularization, and compared the effects of carotid endarterectomy (CEA) and stenting (CAS) on these diameters.

Methods - In 139 patients with symptomatic ICA stenosis ≥50%, randomized to CAS or CEA in the International Carotid endarterectomy study over a 37-month period were retrospectively analyzed. Patients were classified in two groups: (1) patients in whom a stent was deployed and (2) patients without stenting. Double antiplatelet treatment with aspirin and clopidogrel was administered at the time of stenting. SICH was defined as any hemorrhagic transformation with NIHSS score worsening ≥4 points (ECASS II criteria).

Results: A total of 143 patients were included (mean age: 66.1±11.7 years, median NIHSS: 18). Acute phase stenting was performed in 24 subjects (26.8%): 4 intracranial (3 in basilar artery, 1 in middle cerebral artery) and 20 extracranial (internal carotid artery). SICH occurred in 11 patients, 5/24 (20.8%) in patients with stenting and in 3/119 (2.5%) without (p=0.008). No differences were found with respect to baseline NIHSS or iv tPA administration. Acute phase stenting emerged as an independent predictor of SICH after adjustment for potential confounders and procedure duration: OR=7.3 (1.4-36.8, p=0.016).

Conclusions: Our findings suggest that emergent stenting in endovascular treatment of acute ischemic stroke is associated with SICH.

Background – In patients with internal carotid artery (ICA) stenosis, the circle of Willis (CoW) is the primary collateral pathway. We compared luminal diameters in the CoW before and after carotid revascularization, and compared the effects of carotid endarterectomy (CEA) and stenting (CAS) on these diameters.

Methods - In 139 patients with symptomatic ICA stenosis ≥50%, randomized to CAS or CEA in the International Ca-
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Comparison of adverse embolic events and recanalization rate in “Standalone Thrombectomy” (IA) vs “Combined/Rescue Therapy” (IV/IA). RE-COST Study (157 patients treated by SOLITAIRE-FR).

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INTRODUCTION:
Embolic complication appears to be a major drawback of mechanical recanalisation. This technique is widely used in a combined therapy with IV fibrinolysis but Standalone thrombectomy is also performed in numerous cases of IV therapy contra-indications. Recent meta-analysis suggests a better recanalization rate in case of combined therapy (IA/IV) vs IA. Those statements need to be further evaluated in case of stent-retriever devices achieving a very high rate of recanalization TICI2b/3. The purpose of this study was to compare combined (IV/IA) and standalone SOLITAIRE thrombectomy (IA) in a single center series of 157 consecutive procedures.

METHODS:
A retrospective review of our prospective database concerning 157 mechanical thrombectomy using exclusively the stent retriever SOLITAIRE-FR was performed between September 2009 and July 2011. “Rescue”, “Combined” and “Standalone thrombectomy” were performed following a specific protocol algorithm (RE-COST). We focused
our analysis on embolic complications and failure rate of the procedure in case of “Standalone Thrombectomy” (IA) vs “Combined/Rescue therapy” (IA/IV).

RESULTS:
A total of 24 cases (15.2%) of non “TICI2B or 3” were recorded with a total of 11 adverse embolic complications (7%). In the “Standalone thrombectomy” procedures, adverse embolic event was 9% (5/55) vs 5.8% (6/102) in the “Rescue/Combined” therapies subgroup (p > 0.1). In the standalone thrombectomy subgroup 10.9% (6/55) were non TICI3/2B, vs 17.6% (18/102) in the Rescue/combined strategy (p > 0.1).

CONCLUSION: Adverse embolic complication rates were not significantly different between Combined/Rescue (IA/IV) therapies compared to Standalone thrombectomy (IA) using the SOLITAIRE-FR device. Final TICI 3/2B rate was also not different between the two groups IA vs IA/IV.

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Neurovascular coupling of symptomatic patients with cerebral large artery stenosis remains impaired at one month after vascular remodeling by angioplasty of stenting
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Background: Our previous study showed that neurovascular coupling is impaired in patients with major cerebral artery stenosis. The clinical benefits of angioplasty of stenting for cerebral large artery occlusive disease have been investigated in recent years. We hypothesized the impaired microcirculation function may improve after vascular remodeling by stenting.

Methods: We recruited 7 ischemic stroke patients, who had symptomatic internal carotid artery (>60%) or middle cerebral artery stenosis (>70%) and received angioplasty of stenting. Artery flow recovered well after stenting from results of Digital Subtraction Angiography. We performed functional transcranial Doppler tests using a standardized visual stimulation method to assess microcirculatory integrity in the occipital cortex of these patients at 1 day before and 1 month after stenting. Bilateral posterior cerebral arteries were monitored in order to measure evoked flow velocity during resting and visual stimulation phase. Peak systolic flow velocity responses were recorded and time course of hemodynamic response was modeled according to a control system analysis with the parameters gain, natural angular frequency, attenuation and rate time. We also performed functional TCD tests on 17 healthy controls.

Results: Neurovascular coupling responses of stroke patients did not significantly differ before and after stenting in all parameters except resting flow velocity after stenting was lower than baseline (p=0.043). Compared with controls, the functionally induced flow velocity changes (gain) were lower and the response rate times were longer in stroke patients (either before or after stenting,
Conclusions: Neurovascular coupling in non-affected cortex of patients with cerebral large artery occlusive disease remains impaired at 1 month after stenting although the blood supply is improved. Parallel microcirculation dysfunction in patients with large artery occlusive disease may not be easily and quickly corrected by focal or even global blood flow enhancement after stenting, which suggests that neurocoupling dysfunction is mainly due to generalized atherosclerotic disease process.

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Decompressive Hemicraniectomy for Malignant Middle Cerebral Artery (MCA) Infarction: the Experience of a tertiary neurological centre in Ireland. S.K.K Lee1, S Murphy2, D.J.P. Williams3

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Background: Malignant MCA infarction post-stroke is associated with up to an 80% mortality rate. Untreated survivors can have severe disability. Decompressive hemicraniectomy (DC) allows for the outward expansion of the infarcted swollen brain tissue, lowering raised intracranial pressure and reversing transtentorial temporal lobe herniation. We present a series of 5 cases that had DC performed in a tertiary neurosurgical centre.

Methods: Data on patient demographics, Modified Rankin Scale (mRS), hemisphere involvement, timing of surgery, stroke aetiology and discharge destinations were collated from medical notes.

Results: 5 patients (3 female/2 male) aged between 40-67 years (mean 53.2 years) had DC performed. The mortality rate at 30 days was 0%. 2 patients aged >60 years had vascular risk factors: hypertension, diabetes, hypercholesterolaemia. All had a mRS<1 pre-admission. 3 patients had received intravenous thrombolysis with tissue plasminogen activator. 4 patients had DC within 24 hours of clinical deterioration and 1 patient within 48 hours. Prior to DC, all patients had urgent CT brain scanning confirming >50% MCA territory involvement with mass effect and no signs of haemorrhage. Non-dominant hemisphere involvement predominated (n=4). Stroke aetiologies varied: 2 were internal carotid artery dissections, 2 were cardioembolic (atrial fibrillation diagnosed on admission ECG) and 1 from patent foramen ovale (confirmed by TOE). The length of in-patient stay ranged from 36-70 days (n=4). 3 patients were discharged to a rehabilitation facility (mRS=2-3), 1 (67 years/mRS=4) transferred back to an acute hospital, with 1 other patient remaining as an in-patient (62 years/mRS=4).

Conclusion: Decompressive hemicraniectomy provides a life-saving procedure for patients with malignant MCA infarction. In our case series, the prognostic outcome was associated with age and pre-existing co-morbidities, although...
Conclusion: this observational study showed that DS for MMCA in a centre without previous experience, provides similar results than those obtained in the surgical arm of RCTs.

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Decompressive surgery for malignant middle cerebral artery infarcts: the results of randomised trials can be reproduced in daily practice.

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Background: in clinical randomised trials (RCTs), decompressive surgery (DS) for malignant middle cerebral artery (MMCA) infarcts leads to a 50% absolute risk reduction in mortality, and improves the 1-year functional outcome. The reproducibility of these results in routine practice has never been evaluated. The purpose of this study was to test the hypothesis that the results of DS for MMCA in practice are similar to those observed in the surgical group of RCTs.

Methods: we prospectively included the 31 first patients who underwent DS for MMCA. They were screened based on similar criteria than in the meta-analysis. The primary outcome was a Rankin scale (mRS) score of four or less, and secondary outcomes were mRS of 3 or less, and death at 1-year.

Results: 31 patients underwent DS for MMCA. The 1-year mRS was four or less in 22 patients (71.0%), and 3 or less in 16 (51.6%). Seven patients were dead (22.6%).

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Follow-up of Vertebral Artery Origin Stents by Color Doppler Flow Imaging

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Background: Vertebral artery Origin stenting (VAOS) is a main surgical method to treat vertebral artery origin severe (70-99%) stenosis. This study is to evaluate the short-term and long-term effects of VAOS by color Doppler flow imaging (CDFI, investigate the restenosis rate and analyze its impact factors.

Methods: 135 patients with mean age (65.0+-/9.1)years old received VAOS
from June 2008 to June 2011 were enrolled in this study. Among them, 65 cases implanted bare metal stents and 70 implanted drug-eluting stents. CDFI were performed before stenting and 1, 3, 6 and 12 months after stenting. Diameter at the origin segment of vertebral artery, peak systolic velocity (PSV), end diastolic velocity (EDV) as well as resistance index (RI) at the origin and intervertebral artery segment were recorded. The restenosis rate was evaluated and its impact factors were analyzed. Results: The diameter of stenotic segment was improved from $(1.20^{+/-0.38})$ mm to $(2.61^{+/-0.49})$ mm after stenting procedure. PSV and EDV at the origin segment decreased from $(296.02^{+/-113.86})$ cm/s to $(113.47^{+/-36.35})$ cm/s and $(90.08^{+/-47.59})$ cm/s to $(32.21^{+/-12.69})$ cm/s respectively (P<0.001). The PSV and RI at the intervertebral artery segment improved from $(46.88^{+/-17.46})$ cm/s to $(67.79^{+/-24.31})$ cm/s and $(0.54^{+/-0.10})$ to $(0.62^{+/-0.09})$ respectively (P<0.001). Over a median 7 months follow-up period, the cumulative restenosis rate at 3, 6 and 12 month were 7.9%, 16.9% and 25.0% respectively. Furthermore, DES was the only negative predictor for restenosis (OR=0.388, 95%CI: 0.162-0.931, P=0.034). Residual restenosis was a main risk factor for restenosis (OR=3.758, 95%CI: 1.498-9.472, P=0.005).

Conclusion: As a noninvasive and sensitive method, CDFI can detect restenosis in time and is an optimal method to follow up VAOS. In general, VAOS has high rate of restenosis, however, application of DES can prevent restenosis effectively.
Background: Sonolysis is a new therapeutic option for the acceleration of artery recanalization. The aim was to confirm the risk reduction of brain infarction during carotid endarterectomy (CEA) and carotid stenting (CAS) using sonolysis with continuous transcranial Doppler (TCD) monitoring by diagnostic 2 MHz probe.

Methods: All consecutive patients 1/ presenting with >70% stenosis of the internal carotid artery, 2/ indicated to CEA or CAS, 3/ who signed informed consent were enrolled to the study since September 2010 to January 2012. Patients were randomized into 2 groups: Group 1 with sonolysis performed during the intervention using continuous TCD monitoring with diagnostic 2 MHz probe and, Group 2 without continuous TCD monitoring. Neurological examination and brain magnetic resonance imaging (MRI) were performed in all patients before and 24 hours after intervention. The number of symptomatic and asymptomatic new brain ischemic lesions was assessed, including statistical evaluation using T-test.

Results: Eighty-two patients (51 males, mean age 65.1±8.4 years) were included in the study. Out of the 37 patients randomized to Group 1 (26 males, mean age 65.2±8.2 years), 21 underwent CEA (Group 1a) and 16 CAS (Group 1b). Out of the 45 patients randomized to Group 2 (25 males, mean age 65.0±8.5 years), 19 underwent CEA (Group 2a) and 26 CAS (Group 2b). New brain infarctions on follow up MRI were found in 11 (29.7%) patients in Group 1; 4 (19%) in Group 1a and 7 (43.8%) in Group 1b. In Group 2, new brain infarctions were found in 16 (35.6%) patients; 4 (21%) in Group 2a and 12 (46.1%) in Group 2b (p>0.05 in all cases).


Impact of vascular risk factors on intra-stent restenosis of stented cervical and intracranial arteries
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Background. To date, few reports exist on the long-term outcome of carotid artery stenting (CAS) and much fewer reports on the outcome of intracranial stenting are available. For instance, the CAVATAS long-term report showed a combined 22% rate of intra-stent restenosis (ISR) at 5 years post-stenting, but
a low rate of stroke recurrence. Methods. The frequency and possible causes of ISR were analysed retrospectively in 26 patients subjected to stenting of severe (≥ 85%) symptomatic or asymptomatic carotid stenoses or moderate-to-severe (≥ 50%) intracranial or vertebral stenoses.

Results. A procedure-related ischemic complication rate of 7.4% was observed, corresponding to one hemispheric stroke and one TIA. The rate of ISR ≤ 50% was 8% at 2 years in the internal carotid artery (ICA), 50% in the common carotid artery (CCA) at 1 year, with concomitant distal ICA stenosis in 75% of CCA stentings, but all ISR were asymptomatic. Patients with ISR of the ICA were significantly younger (56.8 +/- 4.5 vs. 71.3 +/- 3.6 years, P=0.042) and had significantly more risk factors (5.5 +/- 0.9 vs. 3 +/- 0.3, P=0.012). No ISR ≥ 70% was detected. Peak systolic velocities were significantly reduced in the ICA at 2 years post-stenting compared to baseline (358.2 +/- 24.9 cm/s vs. 96 +/- 31 cm/s).

Conclusions: ISR is relatively infrequent and is usually mild and asymptomatic when present. Its rate may increase however with stenting of previous CEA, younger age and in patients with a higher burden of risk factors.

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Faster Access to Carotid Endarterectomy in the UK

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Background
In 2007 the Department of Health Stroke Strategy in England set a 10 year target that appropriate TIA patients should receive a carotid intervention within 48 hours of symptom. The NICE Guidelines (2008) recommend that patients receive a carotid intervention within a maximum 14 days of first symptom. We are presenting data on delays to carotid endarterectomy between January 2008 and September 2011.

Method
Data on time of symptom, referral and surgery in symptomatic patients were collected continuously using a secure bespoke webtool.

6983 cases were collected between January 2008 and September 2009 (Round 1), 4971 were collected between October 2009 and September 2010 (Round 2), and 5544 were collected between October 2010 and September 2011 (Round 3).

Results
The median delay from initial symptom to surgery has decreased from 28 days in Round 1 to 15 days within Round 3. In Round 3 64% (2638/4112) of patients were referred within 7 days of their
The exact symptom date is not known for all cases.

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Could histological features of carotid plaque explain differences in stroke risk between patients with ocular ischaemia and cerebral events?

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CONCLUSIONS: Carotid plaques from patients undergoing endarterectomy for recent ocular ischaemic events have fewer vulnerable plaque features than those from patients suffering recent cerebral ischaemic events and appear more similar to asymptomatic plaques, possibly explaining the differences in risk of stroke between these groups.

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Extracranial-intracranial bypass is beneficial for patients with severe intracranial steno-occlusive disease of Internal carotid and middle cerebral artery among Asians

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Background- Patients with intracranial stenoses are at considerable risk for recurrent ischemic events. Recently published trials on intracranial stenting and external carotid-internal carotid (EC/IC) bypass in carotid occlusions failed to show benefit over best medical therapy despite improving cerebral hemodynamics. We evaluated cerebral vasodilatory reserve (CVR) in patients with symptomatic & severe steno-occlusive disease of intracranial carotid (ICA) or MCA to select patients who could benefit from
EC/IC bypass surgery.

Methods- Patients with severe steno-occlusive disease of intracranial ICA or MCA were screened with transcranial Doppler (TCD) for their CVR by using breath-holding index (BHI). Patients with impaired BHI were further evaluated with acetazolamide-challenged HMPAO-SPECT. Artery-to-artery embolization was excluded by extended TCD monitoring for spontaneous emboli. Patients with significantly impaired CVR on SPECT imaging were offered EC/IC bypass surgery. All patients were followed up for ischemic events and CVR reevaluated with TCD and SPECT at 4-6 months.

Results- Of the 112 patients with severe intracranial ICA/MCA stenosis, 77 (69%) showed impaired CVR and 46 (41%) underwent STA-MCA bypass. Significant improvements were noted in CVR- TCD-BHI in affected MCA improved from a median 0 (IQR 0.45) to 1.10 (IQR 0.73), p<0.001 and as well as SPECT (P< 0.001). There were no perioperative complications. TCD and acetazolamide-challenged HMPAO-SPECT repeated after surgery showed significant improvement in CVR in patients who underwent STA-MCA bypass surgery. All cases were followed up (median 21 months; range 3 to 39 months) for stroke recurrence. Significant lesser ischemic events were observed in the surgical group (11% vs 45% in medical group; p<0.005) during 21 months follow up. Significant benefit was noted in early morning headache and lethargy in the STA-MCA bypass patients (80% versus 12%; p <0.0001).

Conclusion- Symptomatic severe intracranial steno-occlusive disease with impaired CVR carries a high risk of cerebral ischemic events. Significant reduction in stroke recurrence can be achieved by EC-IC bypass in carefully selected patients.

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Older age hampers recovery after acute stroke even after effective endovascular treatment

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Background.
Outcome after large vessel occlusion stroke is still often poor despite recent advances in revascularization therapies. Previous studies have described the predictors of poor outcome despite successful recanalization. In this study, we ana-
lyzed factors associated to poor outcome despite achieving a small infarct after endovascular treatment of stroke.

Methods.
We performed a retrospective analysis of a prospectively collected cohort of stroke patients treated with endovascular treatments. We collected baseline clinical and radiological characteristics, procedural information and infarct volume in a post-treatment DWI. Functional outcome was studied at 3 months and good outcome was defined as a score of < 3 in the modified Rankin scale.

Results.
In a total of 201 patients treated, a stroke volume of 52 cc best discriminated between favorable and poor outcome. The 104 patients with a small infarct volume had significantly lower NIHSS score at presentation, better ASPECTS score on baseline CT, greater recanalization rate, less symptomatic hemorrhage and better outcome at 3 months compared to patients with greater infarcts. In univariate analysis, older age, female sex, history of hypertension, high systolic blood pressure, lack of IV tPA treatment before endovascular therapy, longer onset to treatment and greater final infarct volume on DWI were associated to poor outcome.

In logistic regression, only older age remained associated to poor outcome (OR 1.09 per year, 95%CI 1.01-1.17, p=0.03).

In exploratory analysis, the risk of poor outcome despite successful endovascular treatment (final DWI volume < 52cc) was 80% in patients over 80 years as opposed to 25% in patients younger than 80.

Conclusion.
Older age is a strong predictor of poor outcome after stroke despite effective endovascular treatment. This effect of age should be considered in the decision making of the treatment of acute stroke with large vessel occlusion.

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Patients undergoing general anaesthesia for endovascular intervention in acute ischaemic stroke may have a worse clinical outcome than those treated with local anaesthesia or conscious sedation

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Background: Some evidence suggests that endovascular therapy for acute ischaemic stroke performed under general anaesthesia (GA) produces worse clinical outcomes than procedures done under local anaesthesia (LA) or with conscious sedation (CS). We sought to determine whether our local experience asserted this view and, if so, what mechanisms could explain worse outcomes in GA patients.

Methods: We performed a single-centre retrospective chart review of all patients undergoing endovascular therapy for acute anterior circulation stroke at our tertiary stroke centre between 2002 and 2010. Baseline demographic and clinical data, reasons for sedation and clinical outcome using the modified Rankin Scale at 3 to 6 months were collected. Patients treated under GA were
compared with those treated under LA or using CS with regards to baseline variables and favourable functional outcome (defined as mRS ≤ 2). Results: A total of 125 patients were treated, 45 (36%) under GA. All baseline characteristics were similar, including stroke severity (median NIHSS at admission of 19 for GA vs 18 for LA/CS, p=0.15). Length of hospital stay was similar in the two groups (17+/−19 days, p=0.42). Functional outcome was worse among GA patients (23% vs 36 % mRS ≤2), but did not reach a level of statistical significance (OR=1.85, 95%CI: 0.8-4.3) There was also a trend toward a higher mortality in the GA group (20% vs 13%, OR=1.8, 95%CI: 0.7-4.9). Conclusions: Despite similar demographic and clinical characteristics in both groups, we observed a trend towards worse functional outcomes in patients treated under GA compared to those treated under LA/CS. This may be due to an independent deleterious effect of GA on functional outcome in acute stroke patients treated with endovascular intervention.

Background
Spontaneous cervical artery dissection (sCAD) is one of the leading cause of ischemic stroke in young adults. SCADs are supposed to be related to a diffuse arteriopathy with connective tissue aberrations. Intra arterial reopening of internal carotid artery by stent-assisted angioplasty may be required in acute management. There are few data regarding long term outcome of these arteries with underlying abnormalities and treated with stent placement.

Methods
A series of 8 consecutive patients (mean age, 48.4±12 years; 4 women) who underwent stent-assisted angioplasty for tandem internal carotid and middle cerebral artery occlusion related to a symptomatic sCAD was reviewed. Baseline and follow up data were collected and analyzed. Stent permeability and carotid morphology was assessed using MR or CT angiography.

Results
Extracranial carotid artery reopening with one or 2 Protege®RX stent was achieved in all patients without procedural complication (14 stents). Mean follow-up was 9 months. No patients presented recurrence of stroke, TIA or dissection. MR and/or CT angiography at 3 to 12 months showed an asymptomatic de novo carotid kinking between carotid...
Background: The risk of recurrent stroke in patients with symptomatic vertebral artery (VA) stenosis is high, with a 90-day risk of up to 30%, and a higher risk in intracranial VA-stenosis than in VA-origin disease. Angioplasty and stenting are now possible, but further data on procedural risks and longer term outcome are needed to assess the feasibility of trials against medical therapy. We report our experience with endovascular treatment for VA-stenosis over a 10-year period.

Methods: All patients who had stenting or angioplasty for symptomatic vertebral artery (VA) stenosis in 2 neurosciences centres from 2001-11 were followed up. We determined the occurrence of procedural complications, recurrent stroke, and the presence of restenosis or vessel occlusion on imaging.

Results: 61 patients (49 men, mean [SD] age 67 [11] years) were treated from April 2001-December 2011. 27 patients had distal VA-stenosis. 35 stents, 15 angioplasties, 9 angioplasty and stent, 2 abandoned procedures (poor access) were performed. Periprocedural stroke occurred in 3 patients (5%), with a higher risk in distal (3/27, 11%) than in proximal (0%, p=0.046) VA-stenosis. During follow-up [median 12 (1-112) months], 5 patients had further strokes (3 proximal, 2 distal VA), 3 (5%) within 1 year of intervention. Re-stenosis or occlusion

Conclusion

Endovascular stenting is a feasible and safe therapeutic strategy in acute sCAD, but may induce carotid kinking in the following months. Long term radiological follow-up is necessary to detect the occurrence of an arterial elongation and to discuss its management by re-stenting or surgery. Stenting of the whole internal carotid artery should prevent this complication. The facilitating role of the underlying arteriopathy needs to be clarified.

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**Outcome of endovascular treatment for symptomatic vertebral artery stenosis – experience of two neurosciences centres**

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Factors associated with aspirin and clopidogrel resistance in carotid angioplasty and stenting (CAS).
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Background: Antiplatelet therapy is critical to stenting procedures but some patients are resistant to aspirin and clopidogrel. We aimed to monitor platelet function in a single-center cohort undergoing CAS and identified factors associated to drug resistance. Methods: We prospectively included patients from July 2010 to December 2011. We used the VerifyNow systems to calculate aspirin reaction units (ARU) and for clopidogrel function assessment, platelet reactivity units (PRUs) and percentage platelet inhibition were measured. We analyzed baseline characteristics and vascular risk factors; body mass index; lipid profile (total cholesterol, high-density lipoprotein, low-density lipoprotein and triglycerides), hematocrit and platelet levels; and concomitant treatments for association to antiplatelet resistance.

Results: 111 consecutive CAS patients were included, with a mean age of 66.9 years and 72% were men. Mean stenosis was 88% and 70% were symptomatic. At baseline, 12 patients (11%) were aspirin non-responders (ARU>550) and 47 patients (42%) were clopidogrel-resistant (≤17% inhibition). Aspirin resistance was associated with higher levels of triglycerides (286 mg/dL in aspirin resistance vs 133 in responders, p=<0,001), higher total cholesterol (198 vs 171, p=0,06); and concomitant treatment of beta-blockers (54,5% vs 45,5%, p=<0,01). Only older age was found associated to clopidogrel resistance (mean age 65,2 in responders vs. 70,4 in non-responders, p=0,006). Conclusion: Among CAS patients, those with hypertriglyceridermia and concomitant treatment with beta-blockers seem to be at higher risk for aspirin resistance, whereas older age may affect platelet response to clopidogrel. Further studies are needed to assess whether this resistance has an impact on clinical outcomes.
Multimodal therapy regime in patients with severe subarachnoid hemorrhage with refractory cerebral vasospasm

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Background:
Severe subarachnoid hemorrhage (SAH) with excessive intraventricular blood may cause a severe cerebral vasospasm (CVS) and an increase of intracranial pressure (ICP). This often leads to consecutive cerebral ischemia. The administration of nimodipine and osmotherapy are the only therapeutic options with a proved clinical evidence. Intra-arterial nimodipine administration, administration of magnesium and therapeutic hypothermia (TH) are experimental treatments with varying clinical relevance and effectivity.

Methods:
We treated 4 patients with severe aneurysmal SAH Fischer °III-IV, Hunt & Hess °I-V. Endovascular treatment (coiling/flow-diverter) of the aneurysms was provided in all cases. All patients were treated with nimodipine i.v./p.o for minimum of 21 days, magnesium-sulfate i.v. (variable period) and TH with body core temperature (BCT) 33-35°C. For TH, we used endovascular catheter (ICY, Cool-line, Quattro - Zoll). Nimodipine i.a. was administered when CVS >300 cm/s were detected in transcranial doppler sonography (TCD) and/or in cerebral angiography (DSA). The total length of TH and BCT were individually adapted to CVS. All patients had an external ventricular drain (EVD), the ICP was measured.

Results:
The mean length of the TH was 12 days (7-18 days). 3 patients were treated with nimodipine i.a., 2 during and 1 before TH. 3 patients experienced a reduction of CVS, 1 patient experienced the reduction of ICP. 1 Patient did not experience CVS or ICP-crisis during TH. All patients were discharged to the neurological rehabilitation, after two months, two of them had modified rankin scale (mRS) 3 and 2.

Conclusion:
According to our results in this case series multimodal therapy regime may help to reduce/prevent CVS and may help to reduce ICP in a severe SAH. We developed a standard operating procedure for future patients in whom side effects and long-term outcome are observed. A randomized trial with a larger cohort of patients is planned.
Stabilization of intracranial hemodynamic status after carotid stenting

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Background and purpose:
Rearrangement of intracranial hemodynamic status could be anticipated after restoring blood flow by the carotid stent for severe stenosis of proximal intracranial artery (ICA). We evaluated how pre-stent intracranial hemodynamic status was changed after stent intervention for the proximal ICA.

Methods:
We initially analyzed pre- and post-stent day 1 transcranial Doppler (TCD) data of 126 patients, who were underwent carotid stent intervention for the severe (>70%) stenosis of proximal ICA. The change of blood flow velocity (BFV) of ipsilateral and contralateral middle cerebral artery (MCA), anterior cerebral artery (ACA), posterior cerebral artery (PCA), and basilar artery (BA) was analyzed. To evaluate the hemodynamic changes occurring in ipsilateral MCA to stent side, the relationship between BFV change of pre- and post-stent ipsilateral MCA (ΔMCA-BFV) and mean BFV of pre-stent ipsilateral MCA (Pre-MCA-BFV). We also analyzed the TCD parameters of 40 patients of total patients, who could be followed-up TCD before and at day 1, and 3 months after carotid intervention, to evaluate whether the hemodynamic status of post-stent day 1 was maintained after 3 months of carotid stent.

Results:
BFV of ipsilateral MCA and ACA was increased just after day 1 of proximal carotid stent, whereas BFV of PCA and BA was decreased (p<0.05). Contralateral MCA and PCA showed slightly increased BFV without statistical significance. The ΔMCA-BFV was inversely correlated with Pre-MCA-BFV at day 1 after carotid stent. And, the inverse correlation observed in ipsilateral MCA was continuously maintained after 3 months of carotid stent (p<0.05).

Conclusion:
The present study observed that hemodynamic stabilization was mainly developed in ipsilateral intracranial vessels after unilateral carotid stent. The intracranial hemodynamic stabilization of ipsilateral side was developed after day 1 and maintained to 3 months after carotid intervention.
New Embolic Brain Lesions on DWI after Carotid Revascularization Therapy
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Background and Objectives
Although the effectiveness of carotid endarterectomy (CEA) in preventing stroke has been proved, a small percent of the patients who underwent CEA had disabling or nondisabling strokes or died during or just after surgery. We aimed to analyze the association of the presence of new lesion on diffusion-weighted MRI (DWI) after carotid intervention with the intervention procedural variables.

Methods
Consecutive clinical and imaging findings of patients who underwent CEA or CAS were collected (n=159). New ischemic lesions were defined based on DWI within 3 days after carotid intervention compared with the preprocedural DWI. Epidemiologic cardiovascular risk factors and information of surgical operation were reviewed. TCD monitoring findings during surgical operation including number of microemboli between pre and post-operation were evaluated.

Results
We analyzed 116 patients who underwent DWI before and after carotid intervention (72 in the CEA group and 44 in CAS groups). DWI revealed new ischemic lesion in 53 patients (5 [38.5%] in female vs. 48 [46.6%] in male, p=0.579).

Conclusion
New ischemic lesions on DWI occur more frequently after CAS than CEA. Restriction to selective shunting during CEA by using of TCD monitoring can help to avoid new ischemic lesion after carotid interventions.
emic stroke due to middle cerebral artery territory stroke with right sided hemiparesis and aphasia (NIHSS 16). Initial cCT demonstrated a dense artery sign in right MCA and standard systemic thrombolysis using rtPA was started about 130 minutes after symptom onset. cT-Angiography confirmed complete MCA occlusion with good collateralisation into the Sylvian fissure. Based on the length of the occlusion and the good collateralisation embolectomy using a retractable stent (Solitaire ® device) was performed about 2.5 hours after onset and resulted a complete recanalization of the MCA but partial dislocation of thrombotic material in the anterior cerebral artery (ACA). GPIIb/IIIa inhibitor was initiated for 24 hours. Transcranial sonography performed the following day revealed an increase of MCA peak systolic flow to 1.6m/sec compared to 1m/sec in the right. MRI 6 days later revealing cortical swelling of the complete MCA territory in T2, sparing the lateral insula and the expected ACA infarction. Furthermore also MRI showed dilated internal carotid artery, MCA and vessels as a sign of high oxygen extraction. 7 days after onset, left sided MCA flow was still increased to 2m/sec, tracheotomy was performed and the patient transferred to neurological rehabilitation with severe left hemispheric deficits. Hyperperfusion syndrome following endovascular recanalization is a rare complication, and should be expected after rapid revascularization especially embolectomy. Especially in patients still under artificial ventilation the diagnosis of cHS is challenging and routine transcranial Dopplersonography may routinely be considered for early detection and initiation of rapid further diagnostics especially MRI. Therapy may consist in rapid normalization of blood pressure, treatment of cerebral oedema, free radical scavengers, and anticonvulsant therapy as potential basic concepts.
Small vessel stroke and white matter disease

**Glycemic control in diabetes mellitus and Age-related white matter changes**

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**Background:** Age-related white matter changes (WMC) are a common finding among the elderly, contributing to cognitive and functional impairment. The association between Diabetes mellitus (DM) and WMC is established, although the exact pathophysiological mechanisms remain to be determined. We aimed to evaluate the relation between glycemic control in DM and age-related WMC.

**Methods:** Prospective study comprising consecutive patients who performed cerebrovascular doppler-ultrasound examination at the Cerebral Hemodynamic Laboratory of our hospital between January and August 2011. Demographic characteristics, vascular risk factors, glycated hemoglobin (HbA1c) levels and neuroimaging were assessed. WMC were classified according to Fazekas scale by 2 neuroradiologists, blinded to clinical and demographic data. HbA1c levels were obtained within one month of brain imaging.

**Results:** A total of 562 patients were included, 57.7% male (n=324) and with a mean age of 66.22±15.19 years. DM was present in 22.2% (n=125) of patients and the mean HbA1c value was 6.55±1.28%. A multivariate analysis revealed statistically significant association between WMC and arterial hypertension (OR=1.9; 95% CI=1.2-3.01; p=0.007), DM (OR=1.6; 95% CI=1.03-2.74; p=0.047) and older age (OR=4.3; 95% CI=2.75-6.83; p<0.001). No significant correlation was found between levels of HbA1c and the degree of WMC (r=0.08, p=0.27). Higher levels of HbA1c were not an independent predictor of WMC in multivariate analysis. Statistical analysis was performed using Spearman correlation and binary logistic regression. Statistical significance was set at p<0.05.

**Conclusions:** Although DM is an independent predictor of age-related WMC, high HbA1c levels did not associate with WMC. This finding raises the possibility of other mechanisms behind the pathophysiology of WMC in diabetic patients. However, we must not forget HbA1c reflects glycemic levels only during the previous months and WMC develop progressively over years.
Automated CT-based assessment of white matter disease: quantification of microangiopathic density reduction in white matter compared to gold standard MRI white matter lesion load

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Purpose:
Severity of white matter (WM) lesion load is difficult to quantify precisely in computed tomography (CT) even though it is the most frequently used imaging modality for brain. This pilot study addressed the need for reliable automated observer-independent quantification of white matter disease in CT. The purpose was to present and evaluate a CT-based automated rater independent method for assessment of microangiopathic WM changes.

Methods and Materials: A probabilistic WM-tissue-map in standard MNI-152 space was obtained from 600 normal MRI scans from two large population studies (published previously). Robust registration of the WM-tissue-map to individual CT space was accomplished by affine linear registration with non-linear refinement (FSL4.1). The tissue-specific density (Hounsfield Unit, HU) within WM-space of the CT image was determined by the mean of all voxel densities weighted by WM content: $\Sigma (HU_{xyz} \times P_{xyz}(WM))/\Sigma (P_{xyz}(WM))$; ($HU_{xyz}$ = density of voxel$_{xyz}$; $P_{xyz}$ = partial WM content at voxel$_{xyz}$). The reduction of HU over WM-space in 40 CT images with visible WM disease was correlated with gold standard MR-based WM lesion volume measurements. Results Automated WM-specific segmentation of brain CT was reliable in 40 cases with varying occurrence of WM-disease. Microangiopathic reduction of density within WM-space showed high correlation with MRI FLAIR-based WM-lesion volume (Pearson correlation coefficient 0.87).

Conclusion Automated quantification of density reduction within WM-space in CT images is feasible and may be used as a surrogate for gold standard MR based WM lesion load. The presented method needs further validation with larger datasets and different CT scanner protocols.

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Lacunar stroke in Serbia and Hungary: comparison of risk factors and stroke mechanisms between Belgrade and Debrecen Lacunar Stroke Cohorts
Poster Session Blue
Lisbon, Portugal 2012

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Background. Lacunar strokes (LS), small subcortical infarcts secondary to single penetrating artery occlusion, account for one quarter of cerebral infarctions. They are typically linked to risk factors (RF) for small vessel disease, with hypertension, diabetes and hyperlipidaemia leading. We aimed to compare RF profile in patients admitted for management of LS to university neurological hospitals in Belgrade and Debrecen, in period 2001-2011. Methods. Data on RFs collected prospectively were compared between 443 Serbian and 436 Debrecen LS patients. Results. Patients from Belgrade were significantly younger (60.8 +/-11.8 years) compared to Debrecen cohort (68.3 +/-11.5; p<0.0001). Equal distribution between gender was registered in Belgrade database (male 50.1%), which was not the case in Debrecen group (male 62.2%; p=0.0004). No difference was found in the prevalence of hypertension (Belgrade 79.6%, Debrecen, p=80.0%; p=0.998) and diabetes (Belgrade 25.3% vs. 20.4% Debrecen, p=0.166). However, patients in Debrecen more frequently had diagnosis of atrial fibrillation (Debrecen 8.2% vs. Belgrade 3.6%; p=0.028) and peripheral artery disease (Debrecen 11.5% vs. Belgrade 1.2%; p<0.0001). Total serum cholesterol levels were comparable (Belgrade 5.5 +/-1.2 mmol/L vs. Debrecen 5.3 +/-1.2; p=0.111). However, fasting glucose was higher in patients from Debrecen (7.0 +/-2.9) compared to Belgrade dataset (5.7 +/-3.0; p<0.0001). Although absolute difference was small, patients from Debrecen had significantly higher hematocrit (0.41 +/-0.05 vs. 0.39 +/-0.05; p<0.0001). Conclusion. In last ten years, RF in LS patients showed typical pattern in both cohorts. However, certain discrepancy, possibly reflecting differences in RF control, ethnic background and socio-economic settings, has been identified: occurrence of LS in Debrecen cohort was associated with higher glucose and hematocrit levels, while Belgrade patients were younger and less frequently had additional cardiovascular disease.
Transcranial Doppler Ultrasound for Screening Cerebral Small Vessel Disease – A Community Study
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Objective: Since elderly subjects harboring cerebral small vessel disease (SVD) are at high-risk of poor clinical outcomes, a simple tool for screening SVD in the community may enhance early detection and research for subclinical SVD. We hypothesized that pulsatility index (PI), which is derived from transcranial Doppler ultrasound (TCD), correlates with severity of SVD and may be useful for screening SVD in the community.

Methods: We performed TCD and MRI upon 205 consecutive elderly subjects who were participants of the Shanghai Aging Study. We investigated the association between PI of middle cerebral artery (MCA) and vertebrobasilar (VB) PI with measures of white matter lesions (WML), lacunes, and microbleeds. We quantified WML using volumetric method.

Results: Multiple logistic regression found that MCA PI was associated with severe WML (odds ratio [OR] 29.56, 95% confidence interval [CI]: 3.59-243.29, p=0.002), and VB PI was associated with presence of microbleed (OR 45.17, 95% CI:1.46-1397.62). At optimal MCA PI cut-off point, the area under curve (AUC), positive predictive value, and negative predictive value was 0.70 (95% CI 0.60-0.80), 34.9%, and 85.6%, respectively for the detection of severe WML. The respective values for VB PI for detection of microbleed were 0.69 (95% CI 0.54-0.83), 14.8%, and 97.5%, respectively.

Conclusion: PI correlates with WML severity and microbleed. With a high negative predictive value, a normal PI may reliably exclude those with severe WML or microbleed.
Background and Purpose: Endothelial progenitor cells (EPC) migrate from bone marrow to systemic circulation in response to brain ischemia. This study was conducted in order to determine the relationship between levels of circulating endothelial progenitor cells (EPC), Endothelin -1 and cerebral hemodynamics in acute lacunar infarctions (LI) resulting from cerebral small vessel disease (CSVD). Methods: The level of circulating EPCs (expression markers: CD31/
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Neurosonologic correlates of age-related white matter changes


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Background:
Age-related white matter changes (WMC) are recognized as an important cause of morbidity with established clinical and cognitive consequences. Nonetheless, many doubts remain on its complex physiopathology. We aimed to clarify the differential contributes of intra and extracranial sonographic variables in the development of WMC.
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Is disturbed vasoreactivity in CADASIL due to changes in caldesmon-h expression on vascular smooth muscle cells?

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BACKGROUND: CADASIL (Cerebral Autosomal Dominant Arteriopathy with Subcortical Infarcts and Leukoencephalopathy) is the NOTCH3-associated angiopathy characterized by degeneration and loss of vascular smooth muscle cells (VSMC) in small arteries. Except migraine with aura, recurrent ischemic strokes and dementia, CADASIL patients reveal disturbed vasoregulation, increased myogenic tone, and reduced cerebral blood flow in the cerebral white matter. These functional abnormalities precede development of histopathological changes in arterial wall. Since the NOTCH3 is responsible for phenotypic stability of VSMC, it is possible that in CADASIL VSMC change from contractile to less differentiated synthetic phenotype. To verify this hypothesis we examined expression of caldesmon-h and other proteins charac-

Methods: All patients undergoing cerebrovascular ultrasonographic evaluation from January to August 2011 in our hospital’s hemodynamic laboratory were included. We excluded patients with ≥80% stenosis or occlusion in any intra or extracranial artery, any stenosis in a Middle Cerebral Artery (MCA), patients without transtemporal sonographic window or neuroimaging within one month of hemodynamic study and all evaluations performed in context of subarachnoid haemorrhage, acute ischemic stroke, intracranial hypertension, brain death or arteriovenous malformations. The mean pulsatility index (PI) of both MCA and mean intima media thickness (IMT) of Common Carotid Arteries were registered. WMC was graded by two neuroradiologists, blinded to sonographic information, according to the Fazekas scale. Vascular risk factors, haemoglobin and plasma osmolality were also analysed. Spearman correlation, independent samples T-test and Chi-square were used for univariate analysis and a binary logist regression model for multivariate analysis.

Results: We included 342 patients, 212 (62.2%) male, mean age: 63.74 years (SD: 15.36). Mean PI was 0.98 (SD: 0.25) and mean IMT 0.78 (SD: 0.21). Both PI and IMT were significantly correlated with the degree of WMC in univariate analysis. In multivariate analysis adjusting for all risk factors only older age (OR: 7.45, 95% CI: 1.59-34.88, p<0.01) and higher PI (OR: 9.29, 95% CI: 2.18-39.49, p=0.01) were identified as predictors of WMC.

Conclusions: These results suggest that PI may act as the final active component on the physiopathology of WMC conveying the effect of vascular risk factors.
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**Differential etiopathyology of age-related white matter changes according to location**

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**Backround:**
Age-related white matter changes (WMC) can occur in the subcortical/deep and/or in periventricular white matter and are prevalent findings among the elderly with important substrates for cognitive impairment and stroke. The pathways involved in the occurrence of WMC are still incompletely understood, but it appears that their heterogeneous appearance seems to imply differences in risk factors, according to their degree and location.
Posters Session Blue
Lisbon, Portugal 2012

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CADASIL: mutational studies in the Portuguese population
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Methods:
We included all consecutive patients that underwent cerebral imaging evaluation (CT or MRI) and cerebrovascular ultrasound from January to August 2011. The neuroimaging assessment were performed independently by two neuroradiologists using CT or MRI studies when available. Rating was performed using visual Fazekas and Age-Related-White-Matter-Changes (ARWMC) scales to assess deep/subcortical, periventricular and basal ganglia white matter changes. Classic vascular risks were identified using the clinical records. Logistic regression was performed including all vascular risk factors.

Results:
We included 562 patients, 58.9% (N=331) male, with a mean age 66.15 years (SD: 15.19). Independent association between deep/subcortical WMC and hypertension OR: 1.85 (1.15-2.96), p=0.01, diabetes mellitus OR: 1.60 (1.02-2.72), p=0.04 and age OR: 4.4 (2.79-6.96), p<0.01, were identified. Similar associations were observed between WMC of the basal ganglia and hypertension OR:1.84 (1.15-2.94) p=0.01, diabetes mellitus OR: 1.78 (1.10-2.75) p=0.02 and age OR:2.80 (1.82-4.30), p<0.01. The only risk factor associated with periventricular WMC was age OR: 6.57 (3.68-11.73) p < 0.01. Conclusion:
These results suggest that the periventricular WMC have a different pathophysiological pathway from the deep/subcortical and basal ganglia WMC and that these may share a common vascular background. Further studies are needed to clarify the pathogenesis of WMC according to their location.
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Whole brain ADC histogram in follow-up of small vessel disease: major scanner effects in a large CADASIL cohort

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Background: Diffusion tensor imaging (DTI) derived histogram metrics – as certain.

Methods: NOTCH3 gene exons 4, 11, 18_19 were sequenced in 732 Portuguese patients with clinical and/or neuroimaging signs suggestive of CADASIL; exon 12 was also sequenced in 375 patients. Screening of all other relevant exons was selectively performed in 51 cases.

Results: A total of 19 different mutations involving cysteine residues were found in 83 cases (11%), 4 of which had not been reported before. Mutation p.R558C, in exon 11, was identified in 39 apparently unrelated patients. Five patients had mutations outside the high-yielding exons and one such mutation (p.C1099Y), in exon 20, was identified in two apparently unrelated patients. Sixteen missense mutations not involving cysteine residues were identified in 63 patients, including 5 known polymorphisms and 11 sequence variants of unknown significance. Three of the latter (p.R163W, p.T575M, p.W1028S) were predicted pathogenic by in silico analysis and were not found in more than 200 healthy subjects.

Conclusions: Clinical criteria used to screen for NOTCH3 mutations will have to be optimized. Exon 20 should be added to the first-tier mutational screening for CADASIL in our population. The significance of NOTCH3 mutations not involving cysteine residues remains uncertain.
global measures of ultrastructural tissue integrity—have been widely reported to correlate significantly with clinical parameters in various diffuse cerebral pathologies. The aim of our study was to evaluate whether histograms obtained from a widely available diffusion weighted imaging (DWI) sequence as currently used in stroke centres with current technical updates and without significant operator dependent postprocessing, can be used similarly to DTI histograms in follow-up studies of CADASIL—a model of cerebral small vessel disease (cSVD). Methods: Clinical and MRI data from a large cohort of CADASIL patients from two centres were evaluated at baseline and during 3 years of follow up. We compared DWI-derived apparent diffusion coefficient (ADC) histogram parameters (mean value, peak location, peak height, kurtosis, skewness) to those of the reference method (DTI Mean diffusivity (MD)) and evaluated the effect of cerebrospinal fluid (CSF) suppression and artefact removal on results. A mixed effects model was used to evaluate the random MRI scanner effect (including all technical updates) on the parameters. Results: We found excellent correlation between ADC and MD parameters especially for mean value, unchanged by CSF suppression. Correction of image artefacts did not alter ADC parameters significantly. In contrast, the magnitude of the random scanner effect on ADC parameters was high and larger than that of clinical scores, sex and age. Conclusion: DWI derived histogram parameters without much postprocessing (CSF suppression, artefact removal) appear promising for monitoring diffuse small vessel disease such as CADASIL. However, given the huge random scanner effect on histogram parameters, the use of different scanners including current technical updates may have major impact on the results and should be evaluated in a multicentre longitudinal trial.

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Dietary Habits in CADASIL Patients: Adherence to Mediterranean Diet Tested Through Online Survey

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A high adherence to Mediterranean Diet (MeDi) is considered potentially protective against cerebrovascular disease and dementia. Since CADASIL (Cerebral Autosomal Dominant Arteriopathy with Subcortical Infarcts and Leukoencephalopathy) is associated with ischemic strokes and vascular dementia, we investigated whether patients with CADASIL tend to follow this diet. A convenient sample of 143 patients with CADASIL was recruited from the US CADASIL Foundation. Adherence to MeDi was evaluated retrospectively by a self-administered internet survey with modified 14-point questionnaire – 14 points signalling the highest adherence. We also collected information about presence/absence of metabolic syndrome, dietary changes after the diagnosis of CADASIL and current smoking. Average MeDi
score was 5.11. Out of 28/125 patients with metabolic syndrome, 39.3% reported low scores (0-4), 53.6% medium scores (5-9) and 7.1% high scores (10-14). Only 32.1% of patients with metabolic syndrome changed their diets after CADASIL diagnosis. 82/125 did not make changes to their diet; in this group 36.6% had low, 54.9% medium and 8.5% high adherence. In conclusion, the majority of patients in the assessed group did not change their dietary habits after CADASIL diagnosis and overall adherence to MeDi was medium to low. In the absence of proven therapy for CADASIL, it is important to minimize modifiable stroke risks. Treating physicians should emphasize the importance of diet and other lifestyle habits especially if patients also have metabolic syndrome. Nevertheless, if MeDi is to be recommended to patients with CADASIL, a larger and prospective study is needed to test if high adherence to this particular diet could be beneficial to all patients with the disease.

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T allele of Apolipoprotein A5 (APOA5) is Associated with Posterior White Matter Lesion in Cerebral Infarction

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Background The apolipoprotein A5 (APOA5) polymorphism has been reported to be related to lipid levels and atherosclerosis. White matter lesion (WML) is associated with gait instability and cognition impairment. The association of APOA5 genotype with WML was less investigated. We aimed to examine the relationship between APOA5 and the severity and location of WML in patients with different types of cerebral infarction. Methods We recruited patients with acute CI admitted between October 2007 and September 2008 to the Landseed Hospital, Taiwan. The clinical manifestation, stroke subtype (TOAST classification), radiological findings and laboratory results were recorded prospectively. Control group (n=70) comprised subjects for health check-up and without a history of cerebra- or cardiovascular diseases. WML in the CT scans were determined by van Swieten scale. The APOA5 genotype T allele (c.553G>T; rs2075291) was determined for all participants. Written
Background: Cerebral Autosomal Dominant Arteriopathy with Subcortical Infarcts and Leukoencephalopathy (CADASIL) is an inherited dominant microangiopathy caused by NOTCH3 mutations. It is characterized by migraine, with or without aura, ischemic events, psychiatric and cognitive disturbances. There is no approved treatment for migraine prophylaxis in CADASIL. Acetazolamide has been anecdotally reported be effective in CADASIL migraine.

Objective: The aim of this study is to describe the efficacy and the tolerability of acetazolamide as a prophylactic treatment for migraine in CADASIL patients.

Materials and Methods: We retrospectively reviewed our database of patients with a genetic diagnosis of CADASIL to identify how many of them were treated with acetazolamide for the prophylaxis of migraine. The efficacy and the tolerability of this treatment were checked from the clinic reports. Acetazolamide was prescribed as prophylactic treatment in 7 patients; the mean duration of treatment was 6 months, and the daily dose taken ranged from 125 to 500mg. Three patients had a total remission, while in 2 patients a reduction of attacks and an improvement of the symptoms were recorded. In one of these, acetazolamide was deliberately taken only during the migraine attack and the beneficial effect started after one hour from the administration. In 2 patients migraine didn’t change. Mild side effects were recorded in 2 patients.

Our preliminary experience expands previous reports and confirms the possible

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**Acetazolamide for the prophylaxis of migraine in CADASIL: preliminary experience**

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Influence of Intravenous Laser Irradiation of Blood on Plasma Lipoprotein

Efficacy of acetazolamide in CADASIL migraine. Based on these data a randomized controlled trial seems worthy to be carried out.

References:

Increased middle cerebral artery pulsatility in patients with leukoaraiosis: enhanced transmission of aortic pulse waves due to increased arterial stiffness

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BACKGROUND: Increased arterial stiffness results in less damping of the arterial waveform and hence increased pulsatility of pre-capillary cerebral blood flow, which may damage small vessels. In the absence of previous studies in patients with recent TIA or minor stroke, we determined the associations between leukoaraiosis and aortic and middle cerebral artery stiffness and pulsatility.

METHODS: Patients were recruited consecutively from the Oxford Vascular Study within 6 weeks of a TIA or minor stroke. Leukoaraiosis was assessed on MRI by the Fazekas and ARWMC scales by two observers. MCA stiffness (transit time: MCA-TT) and pulsatility (Gosling’s index: MCA-PI) were measured with transcranial ultrasound, whilst aortic pulse wave velocity (carotid-femoral PWV) and aortic systolic, diastolic and pulse pressure (SBP, DBP, PP) were measured by applanation tonometry (Sphygmacor).

RESULTS: In 100 patients, MCA-PI was significantly greater in patients with leukoaraiosis (0.93 vs 0.78, p<0.001). Severity of leukoaraiosis was correlated with MCA-PI and aortic-PWV (stepwise models: ARWMC: r²=0.314, MCA-PI p<0.0001, ao-PWV p=0.007; Fazekas scale: r²=0.344, MCA-PI p<0.0001, ao-PWV p=0.026) for both periventricular and deep white matter lesions, independent of age, gender, aortic SBP, DBP and PP and MCA-TT. MCA-PI was independently associated with aortic SBP and PP, aortic-PWV and MCA-TT (r²=0.419, ao-PP p<0.0001, ao-SBP p<0.0001, MCA-TT p=0.0001, ao-PWV p=0.025).

CONCLUSIONS: MCA pulsatility was the strongest physiological correlate of leukoaraiosis, independent of age, and was dependent upon aortic SBP and PP and aortic and MCA stiffness, supporting the hypothesis that large artery stiffening results in increased arterial pulsatility, with transmission to the cerebral vessels resulting in leukoaraiosis.
LEVEL AND APOLIPOPROTEIN PARAMETERS IN LACUNAR STROKE
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Background and Purpose: The aim of this study was to evaluate the effect of intravenous laser irradiation of blood (ILIB) on plasma lipoprotein level and apolipoprotein parameters in acute phase of lacunar infarct (LI) in combination with white matter disease (WMD) resulting from cerebral small vessel disease (CSVD). Material and Methods: We assessed total cholesterol (TC), low-density lipoprotein-cholesterol (LDL-C), very low density lipoprotein (VLDL), triglycerides (TG), high-density lipoprotein-cholesterol (HDL-C) levels, TC/HDL-C ratio, apolipoprotein A1 (apo A1), apolipoprotein B (apo B) levels and the apo B/apo A1 ratio at 1-3 days of LI and after course of treatment (10-12 days) at 17 patients of the main group (middle age 65±11,3 year) and 23 patients of the control group (middle age 60,3 ±15,8 year). Patients of the main group in addition to the basic therapy (aspirin and magnesium) received ILIB by the semiconductor laser at wave length 0,67µm, and radiation power at the end of the light guide – 2,0-3,0 mW with application time 20 minutes, 7-8 procedures per course. Results: Before treatment, patients of the main group had moderate changes of lipid metabolism - increased TC level to 5,65±1,03 mmol/l, reduced HDL-C level to 1,23 ± 0,21 mmol/l, increased LDL-C and TG levels 3,59±0,92 mmol/l and 2,22±1,03 mmol/l, increase of TC/HDL-C ratio to 3 ,7 ± 1,0. Course application of ILIB led to reduction of TC level to normal values - 4,72 ± 0,97 mmol / l (p = 0.0004), decrease in LDL-C levels to 2,54±0,66 mmol / l (p=0,04). The level of apoB after ILIB decreased from 0,87±0,25 to 0,72±0,2 g / l (p = 0,02). Conclusion. Patients in acute phase of LI in combination with WMD resulting from CSVD were characterized by moderate changes of lipid metabolism. Intravenous laser irradiation of blood in patients in acute phase of LI in combination with white matter disease resulting from CSVD decreased amount of TC, mainly due atherogenic cholesterol fraction - LDL-C (an indicator of response to therapy) was associated with a decrease of its structural transfer - apo B.

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IS CAROTID STIFFNESS INCREASED IN ISCHEMIC LEUKOARAIOSIS?
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BACKGROUND Ischemic leukoaraiosis (IL) is an important clinical state due to its relationship with cognitive decline and gait disturbances. Pathogenesis of the disease is still unknown. So far it
has been no evidence of a connection between arterial stiffening of common carotid artery and IL. Therefore the aim of this research was to determine common carotid artery stiffness in patients with IL. We hypothesis that stiffness of common carotid artery is increased in patients with IL.

METHODS 20 patients with IL and 21 healthy controls were assessed in this study. Groups were matched in age, sex. Anamnestic data for stroke and coronary heart disease risk factors were obtained in addition to MRI and CT scans. Common carotid artery stiffness was measured using Doppler method (ALOKA α10). We assessed both β index of arterial stiffness and intima-media thickness. Statistical differences between the patients and controls were calculated using t-test and chi-square test. Relationship between was assessed using logistic regression model.

RESULTS T-test have shown that β index is increased in patients with IL (p<0.05). Other stroke risk factors such as sex, age, diabetes, smoking, hypertension, and intima-media thickness there was no statistical significance between patients with IL and controls (p>0.05). Logistic regression models have shown significant relationship between β index and IL (p<0.01; OR 2.1; CI 95% 1.3-4.59).

CONCLUSIONS Common carotid artery stiffness is increased in patients with IL which can be an important pathological factor in etiology of IL.
carotid artery (ICA). Hereby we present a young patient with a specific combination of these abnormalities and a seemingly positive family history but with a non-mutated COL4A1 gene.

Methods
We examined a 29 year old male patient with a history of recurrent minor ICHs causing mild motor and sensory hemisyndromes on alternating sides. His father had a major subarachnoid hemorrhage from an ACoA aneurysm at the age of 23 years. General physical and neurological examination, brain MRI (with T1, T2, FLAIR, GRE, DWI, MRA), laboratory tests, ophthalmologic examination and genetic testing for the entire COL4A1 gene have been performed.

Results
MRI showed subcortical ICHs of different age; severe cSVD with diffuse white matter damage and multiple cerebral microbleeds; and small aneurysms of the intracranial ICA bilaterally. No abnormality was seen on fundoscopy. Laboratory workup revealed significant microscopic hematuria and elevation of CK. Genetic testing for COL4A1 was negative.

Conclusions
Our patient showed an unprecedented combination of manifestations of the COL4A1 disease spectrum without mutation in the gene. Further genetic studies of the patient and family members are planned to search for a possibly new genetic cause of a systemic vasculopathy.
are postulated to mirror those in cerebral microvessels. Retinal fractal dimension measures the global geometric complexity of the retinal microcirculation. Previous papers described independent but opposing associations between retinal fractal dimension and lacunar infarction. We studied the relationship of retinal fractal dimension with lacunar infarction and leukoaraiosis among Asian stroke patients who have a high prevalence of cerebral small vessel disease.

Methods:
We recruited acute ischemic stroke patients admitted to the Singapore General Hospital from 2005-2007. Stroke aetiology was subtyped using the TOAST classification. We excluded other determined or undetermined aetiologies. Leukoaraiosis on brain imaging was graded in comparison to standardised images. Retinal fractal dimension was assessed from retinal photographs, taken within 7 days of stroke onset, blinded to clinical and imaging data.

Results:
Among the 532 ischemic stroke patients included, 52% had lacunar, 11% cardioembolic and 37% large vessel aetiologies; 37% mild leukoaraiosis and 9% severe leukoaraiosis. Lower retinal fractal dimension was significantly associated with older age, hypertension, dyslipidaemia and non-smokers. There was no difference in median retinal fractal dimension between patients with lacunar (1.393, IQR 1.352-1.424) and non-lacunar infarction (1.384, IQR 1.329-1.429) (p=0.204). Median retinal fractal dimension differed between patients with no (1.397, IQR 1.353-1.433), mild (1.384, IQR 1.339-1.419), and severe leukoaraiosis (1.357, IQR 1.317-1.411) (p=0.009), however this relationship did not persist after adjusting for age and smoking status. (p=0.736).

Conclusion:
Among Asian ischemic stroke patients, retinal fractal dimension is not associated with cerebral small vessel disease manifestations of lacunar infarction and leukoaraiosis.