Epidemiology of stroke

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Background and purpose: According to official statistics in Eastern European countries since few decades stroke mortality rate has remained high. It has been shown, that in Poland stroke mortality failed to decline in the period 1984 through 1992. Since that time the stroke management in our country has changed, especially in the big cities, where stroke units have been developed.

The aim of this study was the comparison of stroke mortality rates, estimated on the basis of two prospective population based studies performed in Warsaw in 1991/1992 and 2005.

Methods: Case fatality rates and stroke mortality rates for the First Ever In-time Stroke (FEL) have been estimated on the basis of two population based studies: Warsaw Stroke Registry (WSR) (population 182649) - registration from 1991 through 1992 and European Register of Stroke (EROS) (population 127735) - registration - year 2005. In both studies mortality rates were standardized to European population by the direct methods.

Results: Contrary to the incidence rates which did not changed significantly between 1991/1992 and 2005: 141.3 vs. 143.3, 30-day and 1-year case fatality rates decreased significantly from 43% (95% CI: 38.1-47.2) to 17.4% (95% CI: 11.4-25.0) and from 59.7% (95% CI: 55.3-64.2) to 31.7% (95% CI: 25-42) respectively for WSR and EROS studies. Stroke mortality rates has also significantly declined from 90.6/100 000 in 1991/1992 to 37.5/100 000 in 2005.

Conclusion: The present study has shown significant decline in stroke mortality in Warsaw, connected probably with better management of patients in the acute phase of stroke: in 2005 92% of stroke patients from catchment area were treated in Stroke Units, and 5.3% of them received rt-PA.

The study was performed as a part of EU grant (QLG4-CT-2002-0191)

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CAROTID IMT AND SMALL, NON-STEMOTIC CAROTID PLAQUE HAVE A DIFFERENT PREDICTIVE VALUE OF FATAL AND NON-FATAL STROKE AND MI IN A MULTI-ETHNIC COHORT

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Objective: To determine the predictive value of carotid IMT and plaque for ischemic stroke, MI and vascular death in an elderly multi-ethnic cohort without history of overt vascular disease.

Methods: As part of the Northern Manhattan Household Study, B-mode carotid ultrasonography was performed in 1,475 subjects (mean age 68±4 years; 60% women; 56% Hispanic, 23% African-American, 19% Caucasian). Plaque was defined as a focal protrusion 50% greater than the surrounding wall thickness and measured at maximal plaque prominence (MPP). IMT was a composite measure of the near and the far wall of all carotid segments out of the proportion of plaque. The association of MPP and IMT with vascular outcomes was analyzed by Cox proportional hazard model.

Results: Carotid plaque was present in 59% of cohort. Mean IMT was 0.88±1 mm, the 75th percentile of MPP was 1.8 mm. After mean follow-up of 4 years, 125 subjects had fatal or non-fatal stroke, 103 MI, and 283 had stroke, MI or died. The top vs. lowest quartile of IMT was associated with a significant 4.2-fold increased risk (9.1-fold for MI), and MPP with a significant 1.3-fold increased risk (1.4-fold for MI).

Conclusions: Carotid IMT and plaque have different predictive values. Carotid plaque had a greater predictive value for ischemic stroke, while IMT among those without carotid plaque had a stronger association with MI. Our results support the hypothesis that carotid IMT and plaque are different phenotypes of atherosclerosis.

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THE VALIDITY OF DEATH CERTIFICATION FROM STROKE AND ITS IMPLICATIONS

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Background and purpose: Mortality statistics are mostly based on death certificates, so it is important the accuracy of the information stated. A population-based stroke registry carried out in Northern Portugal provided an opportunity to ascertain the accuracy of death certificates in what regards stroke as the cause of death.

Methods: All death certificates from 5 civil jurisdictions whose stated cause of death was stroke and other undefined causes (cerebral atherosclerosis, senile dementia, senility and unknown) were selected. Those corresponding to 5 health centres family patient lists were reviewed. To validate the cause of death, information was collected in clinical registries and post-mortem studies or by interviewing a family member or the patient’s doctor. Stroke was considered the cause of death if death happened in the first 30 days after stroke or if the patient remained dependent until death and no other obvious cause such as accident/suicide was stated. The sources of explanation for inaccuracy considered were age, gender, urban/rural residence, and place of death (home, nursing home, central, private or district hospital).

Results: From a total of 834 death certificates, 477 were reviewed. Stroke was the stated cause of death in 315 and it was confirmed in 55%. In the remaining 162 certificates, the cause of death was reclassified as stroke in 14%. Confirmation of stroke was strongly associated with age (chi-square=18.7, df=3, p<0.001), and place of death (chi-square=91.1, df=4, p<0.001). When death occurred in health institutions, confirmation decreased from 95% to 72% with increasing age (chi-square=52.2, df=1, p<0.013). For deaths occurred at home/nursing home there was not an age trend and confirmation ranged from 20% to 47%.

Discussion: The high stroke mortality rate in Portugal may be partially explained by the inaccuracy of death certification. Moreover, with an increasing aged population, the inaccuracy trend with age may imply a bias when comparing trends in mortality rates over time.

Study supported by: FCT/FEDER project POCI/SUS/ESP/59885/2004

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VARIATION IN THE DAY OF WEEK OF STROKE ONSETS AND EMERGENCY DEPARTMENT VISITS: RESULTS FROM THE REGISTRY OF CANADIAN STROKE NETWORK

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Background: Studies examining variations in stroke occurrence by the day of the week have reported inconsistent results. We aimed to determine variations in both stroke onset and ED arrival by the day of the week and to determine whether the day of arrival impacts on the quality of care and patient outcomes.

Methods: We analyzed data from the Registry of Canadian Stroke Network from 12 stroke centres in Ontario Canada from July 2003 - June 2006. Data concerning the day of stroke onset and ED arrival, stroke type, history of past stroke, risk factors, comorbidities, stroke severity, hospital management and outcomes were abstracted from the patient’s chart by trained nurses using specialized data entry software.

Results: There were 10366 patients with a first-ever acute stroke for this analysis. No particular pattern of variation in stroke onset by the day of the week was observed regardless of stroke type and severity. However, the volume of ED stroke
visits was significantly lower on weekends compared to weekdays, especially for patients with mild stroke (CNS≤7). The quality of acute stroke care (based on timely CT imaging, stroke unit admissions, and the use of iPA) and the 7-day mortality were not affected by the day of hospital arrival. Multivariate analyses showed that the patients who came to the ED on the same day of their stroke onset were more likely to be discharged without symptoms (mRS=0, RR: 2.54, 95% CI: 2.26-2.85) and stayed in hospital for a shorter length of time (RR: 0.85, 95% CI: 0.84-0.87) than the patients who came to the ED on the day after stroke onset.

Discussion: There was no association between the day of week and the incidence of stroke onset regardless of stroke type and severity, and in our Regional Stroke Centre patients care did not suffer on weekends. However, patients who had their medical care on the day of their stroke onset were more likely to fully recover. These findings should enhance public educational programs by supporting the need for patients with acute stroke to go to hospital immediately.

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ETERNITY AND STROKE OUTCOMES – A 10 YEAR FOLLOW-UP STUDY OF SOUTH ASIAN AND CAUCASIAN PATIENTS WITH STROKE IN LEICESTER (UK)

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Background: Little is known about the relationship of ethnicity and stroke outcomes, particularly in S Asians, who form the largest ethnic group in the UK(4.1%). Our study was a 10 year follow-up of a project carried out in 1996 in Leicester when we compared outcomes in S Asian and Caucasian patients at six months post stroke. No significant difference was found in mortality and disability at 6 months and contrary to expectations S Asians were more likely to be admitted to hospital than whites.

Method: Of 176 patients (88 S Asian, 88 White) from the original Study outcomes were identified for 82 S Asians and 84 Whites. We studied survival time to death from original stroke and need for institutional care

Results: At 10 years 64 of the S Asians were dead(79%),13 of the Whites (85%).15 of the S Asians(18%) were admitted to a Care Home cf 19 of the Whites(22%)

Kaplan Meier analysis showed no statistical difference in mortality and survival between the two groups, irrespective of age and gender. S Asians as were less likely to be institutionalised than their white counterparts. Age was a significant predictor of mortality in both whites and Asians. Even in Young Asians (<65yrs) mortality was high, and 6 out of 31 (19%) were admitted to care homes.

Discussion: Our study confirms that the well-known relationship in white patients that age is a powerful predictor of mortality after stroke, also exists in S Asians. In contrast to common-held beliefs S Asians are as likely to be admitted to institutional care as whites following stroke. The concept of an extended family providing care for disabled relatives in this ethnic group is probably a myth. The age profile of S Asians in the UK is considerably younger than that of Caucasians, but the Asian population has a considerable burden of stroke disease. As this population ages the demand for institutional care will increase disproportionately. We should address this now by targeting preventative measures at this group and plan for an increased need for care either in the community or nursing homes.

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THE AGREEMENT BETWEEN DOCTORS AND STUDY PARTICIPANTS IN RATINGS OF DEPENDENCE USING THE POSTAL MODIFIED RANKIN SCALE (mRS): PROSPECTIVE, POPULATION-BASED STUDY

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Background and purpose: Our study was conducted throughout the Czech Republic. Participants >40 years old were personally interviewed via a structured and standardized questionnaire concerning general knowledge, risk factors, warning signs, and response. The average STAT-score was 27% and 18% scored >50. The predictors of such a score were (for each 10 year increment, OR 1.4, 95%CI 1.1-1.6), knowing that stroke is a serious disease (OR 1.9, 95%CI 1.1-3.2), and knowing that stroke can be treated (OR 2.0, 95%CI 1.3-3.2).

Conclusion: Knowledge about stroke in the Czech Republic was fair, yet response to warning signs was poor. Our study is the first to identify that correct response was influenced by knowledge that stroke is a serious and treatable disease and that stroke is a treatable disease by recognition of stroke symptoms. This highlights new directions and audiences for public awareness campaigns.
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THE PREVALENCE OF METABOLIC SYNDROME IN HYPERTENSIVE PATIENTS IN TAIWAN
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Background: The prevalence of hypertension in Taiwan was high. Metabolic syndrome (MetS) is increasing very common worldwide, but the prevalence of MetS in Taiwan is still lack of large-scale survey, especially in hypertensive patients. The diagnostic criteria proposed by the Modified Adult Treatment Panel III (ATP III), World Health Organization Asia Pacific Guidelines, MS-IDF(C) (the International Diabetes Federation criteria for Chinese) and MS-TW (Taiwan criteria) are similar in many aspects, but they also reveal fundamental differences in positioning of the predominant causes. The aims of this study were to collect the prevalence of MetS among hypertensive patients and to compare the difference of the prevalence by different criteria.

Methods: This was an observational, cross-sectional, multi-hospital based study. Subjects were enrolled from 38 outpatient clinics. 3,302 hypertensive patients, aged 55-80 were enrolled. Subject must understand the questionnaire and to sign informed consent. Several measurements were made to evaluate the patient’s profiles of MetS, based on history, physical and laboratory examinations.

Results: The patients’ age were 67.4±7.0; height 159.0±8.2(cm); weight 66.1±11.0(kg); BMI 26.1±3.9 and the waist circumference 91.9±10.4(cm). There were 71.08% patients had MetS by WHO Guidelines, 60.54% by Modified ATP III; 42.31% by MS-TW; and 64.18% by MS-IDF(C).

Discussion: This is a first multi-hospital based survey of MetS in hypertensive patients in Taiwan. By comparing with different criteria for MetS, the prevalence of MetS by MS-TW is the lowest as 42.31% and by WHO Guidelines is as high as 71.08%. Since stroke is the first cause of death in patients more than 65 years old in Taiwan, hypertension is the most important risk factor for stroke and the prevalence of MetS in hypertensive patients is high. It is important to correlate these different criterion of MetS with vascular outcome to tell which criteria is more useful to care the hypertensive patients with MetS in Taiwan for stroke prevention.

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RESULTS OF THE STROKE DATA REGISTER IN SEVILLA DURING THE FIRST-YEAR REGISTRATION PERIOD
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Background and purpose: Registration of stroke cases is key to produce knowledge. However, experiences remain limited. Our proposal is a pre-hospital analyses on epidemiologic factors control and in-hospital results of health care. Methods: Every stroke case was consecutively recorded in the register since the patients were admitted in the Emergency Service (ES) – including 6-month follow-up-. Descriptive studies on drug compliance per type of conventional risk factor (FR) on arrival at ES and type of stroke (ischemic-IS; hemorrhagic-H) were conducted. Stroke cases were classified by age and sex, stroke severity was assessed by the Canadian Neurological Scale Score (CS) and results were analyzed by the Rankin (R) at home discharge.

Results: 1052 were examined. 51.3% of women (f) aged 76.9±11.1 and men (m) aged 71.7±12.1. Incidence of risk factors by sex and medication: high blood pressure in 67.8% (f), 56.4% (m); 85.2% was prescribed medication; arrhythmia in 25.4%, 17.4%; antithrombotic therapy (aT) in 72.9%, antiagulant drugs (ac) in 37.2%; TIAs or previous stroke in 30.2%, 36.1%, with aT (77.9%) and ac (15.2%); Heart disease: Caring for the acute phase (7.4%); hyperlipemia in 22%, 26%, 52%; diabetes in 40.4%, 36.5%, 90.4%. IS in 91.2% (f) and 86.8% (m); H 8.8% and 13.2%. 36.7% of discharges from the ES with a score of 8.8(6-9.1) in CS; 30.7% was referred to the Neurology Department (NL) with score of 9.3(9.1-9.4); 24.8% was admitted in the NL with a score of 7.8 (7.3-8.2); 5.7% was admitted in the internal Medicine Department (MI) with a score of 6.3 (5.3-7.2). Rankin after hospitalization in NL 1.9(1.7-2.1) and in MI 3.3(2.8-3.9). Mortality rates: 10.1% with no difference by sex; 7% of IS cases and 35.1% of H cases; 2.7% in the HES (2.03% of H, 18.4% of the total H cases).

Discussion and conclusions: Excellent compliance for risk factors. We find that the increasing incidence of IS in women is characteristic. The study revealed that there is no difference by sex in mortality rates in-hospital and that in H remain high.

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THE BASIS FOR ACUTE STROKE NURSING IN HUNGARY: THE CHARACTERISTICS OF NURSES’ CARING ATTITUDE FOR STROKE PATIENTS
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Background: Stroke gained an important place in the Hungarian Public Health Program. Based on this national health strategy new guidelines and protocols were developed for nursing of acute stroke patients. The aim of the study was to describe nurses’ attitude toward caring for stroke patients and using nursing protocols.

Methods: A cross sectional study design was used to explore the main dimensions of 271 nurses’ attitude in stroke patient care in 11 institutions representing all regions of Hungary. A self-administered pilot-tested questionnaire was used to collect data in the following dimensions: nurses’ physical and mental health, intent to leave the profession, quality of nursing care, preparedness for high quality of care. The data were collected in the beginning of 2005. For the data analysis Chi-square test and ANOVA were used by SPSS 11.0.

Results: The response rate was 74%. The mean average years of working with stroke patients were 10 years. 77% of them had nurse qualification. There were a significant correlation between the nurses’ physical and mental stress with the dominance of physical overload (p<0.05). 70% of nurses have already thought at least once of leaving the stroke unit. In spite of the difficulties the majority of nurses reported about good level of quality of care. The nursing documentation does not include specific aspects of stroke nursing (61%).

Discussion: Caring for stroke patient in the acute phase causes more stress to nurses than working in other departments. There is an immediate need to better the physical conditions of stroke units in terms of nursing. Mental support is demanded by the nurses caring for acute stroke patients. Also the continuous improvement of knowledge in stroke nursing required for the quality nursing.
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IS THERE A GENDER DIFFERENCE IN THE MANAGEMENT OF STROKE PATIENTS IN NORTH GLASGOW?

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Introduction: A gender difference in the management of patients with cardiovascular disease has been reported. North American studies have shown a similar trend in stroke disease. We evaluated whether there was a gender difference in stroke care in North Glasgow.

Methods: We prospectively audited patients admitted with a diagnosis of stroke from 01/06/2004 to 31/08/2006. Outcomes included: mortality; use of antiplatelets, statins and antihypertensives and stroke subtype. Chi squared and 2 sample t test were used for statistical analysis.

Results: 1743 patients were studied (832 (47.8%) were male). Mean ages were 68.6 years (male) and 71.7 (female). No difference in stroke subtype, as assessed by Oxfordshire Community Stroke Project classification (OCSP) was apparent between genders. There were similar rates of intracerebral haemorrhage in males and females (72 (0.09%) versus 76 (0.08%). Male stroke patients were significantly more likely to be prescribed an angiotensin converting enzyme (ACEI) inhibitor (42.9% versus 37.2% p=0.027) and statin (86.7% versus 80.9% p=0.003). Female patients had significantly more diuretics prescribed (40.4% versus 32.5% p<0.001). There was no significant gender difference in the use of warfarin, aspirin or other anti platelet agents at discharge. Females had a significantly higher mortality (15% versus 9.7%, p=0.001) and were less likely to be able to walk unaided after event (47.3% vs 53.3%, p=0.013).

Conclusions: Significant differences in drug therapy and outcome exist between men and women after stroke. These cannot be fully explained by differences in age or stroke subtype. Further work is required to explore these differences and their implications for delivery of stroke care.

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STROKES IN POSTERIOR CEREBRAL ARTERY AND FETAL VARIANTS

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The incidence of clinical and etiology in strokes of posterior cerebral artery (PCA) show a great heterogeneity. The contribution of the carotid territory to its affection is unknown.

Patients/Methods: We carry out a retrospective study of the patients with stroke in territory of PCA, entered in our center among 2001-2005. We made a clinical analysis of risk factors, ultrasonography study, determination of affected vascular territory by magnetic resonance(MR) and prognosis.

Results: They represent 9% of the strokes (113 patients). The etiology was in 40% indeterminate, 33% cardioembolic and 27% atherothrombotic. In the study of MR 80% of strokes show superficial infarcts, 19% superficial and deep one and 1% bilateral PCA stroke. The clinical affection in scale NIH is worse in those of other territories (p=0.003). Visual alterations were most frequent (82%), followed by motor(56%) and sensitive disturbances(29%). The 40% of the patients relate headache and so alone 21% of them showed the triad of hemiparesis, hemianopsia and headache. In the vascular study, 22% of them show significant carotid stenosis and 17% the fetal variant of ACP. Associated these findings with severe clinical affection (p=0.005). With regard to the prognosis, the mortality was 3% and recurrence 5%.

Discussion: In our series 17% of PCA strokes showed persistence of fetal circulation (P1 hypoplasia) and the majority associated important haemodynamic affection of the carotid that irritated it, related to severe carotid stenosis. The worse clinical affection and functional outcome in this variant could be in relation to the lack of effective and collateral circulation.

Conclusions: The etiology of the PCA strokes in the majority of cases is indeterminate. The presence of anatomic variant of PCA and its association to severe carotid stenosis is related with worse clinical affection and prognosis.

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SEASONAL VARIATION IN STROKE ADMISSIONS

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Background: Evidence of seasonal variation in stroke is controversial. Winter excess or peak incidence in spring has been found in mortality and hospital-based studies of ischaemic stroke. However in the past 3 decades, many studies have looked at a correlation between season of the year and stroke incidence but results have been inconsistent. In this study we assessed the trend of 3230 stroke admissions into a District General Hospital related to season of the year over a period of 5 years.

Methods: The stroke data was identified from the database by the ICD 10 codes for strokes and analysed using SPSS to identify stroke admission related to the season. Seasonal variation of ischaemic, haemorrhagic and uncategorised stroke sub-types was also analysed.

Results: Our study showed that the occurrence of stroke in relation to the season of the year did not have any definite pattern. However as an average, maximum percentage of strokes occurred in spring (approx 26.5%) and the least in autumn (24.07%). However these differences were not statistically significant. The haemorrhagic and ischaemic strokes did not have a consistent seasonal pattern to hospital presentation.

Discussion: In the past, conflicting results on seasonal variations in occurrence of stroke have been reported in population-based studies. In studies conducted in countries that experience extremes of temperature, seasonal variation does exist but no seasonal variation is observed in stroke occurrence in subtropical countries. In keeping with the studies from Oxfordshire, Framingham and Italy, our study did not show any consistent seasonal trend over the 5 years for hospital admissions with stroke. In contrast to the winter excess of ischaemic stroke of 20-30% found in mortality studies, our study did not show any seasonal pattern of presentation in ischaemic or haemorrhagic strokes. However, not all strokes had been classified and the winter-excess may partly be determined by the seasonal occurrence of complications of stroke such as pneumonia.

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SURVIVAL, RECURRENT AND CAUSE-SPECIFIC MORTALITY FROM STROKE IN TBILISI: PRELIMINARY RESULTS OF THE FIRST PROSPECTIVE POPULATION-BASED STUDY IN GEORGIA

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Background: Stroke is among the major non-communicable diseases with enormous burden on the society. However, studies about epidemiological patterns of the disease in developing countries are still lacking. The purpose of the present study was to determine survival, recurrence and mortality from stroke in Tbilisi, capital of Georgia, a developing country in the South Caucasian region.

Methods: In the framework of the joint Swiss-Georgian epidemiological project we identified a cohort of 233 first-ever stroke patients from 2000 to 2003 in Sanzona suburb of Tbilisi and followed-up prospectively. All cases of recurrent stroke and stroke mortality were registered by using overlapping sources of information and standard criteria.

Results: Since November 2000 to date, 151 (65%) stroke patients have died out of the cohort of 233 patients. Stroke recurrence rate was 42%. Eighteen percent of death cases were related to stroke recurrence. The most frequent cause of death were direct consequences of stroke (brain edema and herniation) in 35% of cases, followed by cardiac disease (myocardial infarction, congestive heart failure or arrhythmias) in 31% of cases and respiratory tract disease (pneumonia) in 23% of cases. Predictors of early mortality (<3 months) were age, hemorrhagic nature of stroke and stroke severity measured by NIH Stroke Scale, whereas late mortality (>3 months) was associated with age and cardiac co-morbidity.

Conclusion: Stroke in Tbilisi, Georgia is characterized by high mortality and recurrence. This may be due to inadequacy of stroke service and shortages in the secondary preventive measures. The results of the study may have important implications for public health campaign aiming at reducing the burden of stroke throughout the country.

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POSTERIOR CIRCULATION ISCHEMIC STROKE IN CHINESE POPULATION

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Background: Posterior circulation ischemic(PCI) is a common cerebrovascular disease,which accounts for 20% in ischemic stroke.A patient who has an attack of PCI is often less evaluated and treated, and the anatomical distribution of infarcts in PCI is less well defined.Data regarding this aspect among Chinese stroke patients are scarce.

Patients and Methods: We described clinical findings, the anatomical distribution, and risk factors among 95 patients who had suffered from PCI and were...
registered from August 2004 to November 2006. All patients underwent digital subtraction angiography (DSA) and brain imaging (CT or MRI), and most of them had extracranial ultrasound and TCD.

Results: Infarcts were localizable in 86 of 95 patients (90.5%), the others could not be definitively located clinically or by brain imaging. Infarcts were in proximal territory in 42 patients, middle territory in 35 patients and distal infarcts in 23 patients. 72 patients had isolated infarcts and 14 patients had multiple infarcts. 69 patients (80.2%) had vascular lesions in the posterior circulation limited to the proximal territories, while 3 (3.5%) also had vascular lesions in middle territory and 14 (16.3%) in distal territory. Hypertension, diabetes, coronary artery disease and hyperlipidaemia were the main risk factors. Motor weakness was present in 42 patients (44.2%). Land vertigo was found in 41 (43.2%) 33 patients (34.7%) had visual abnormalities, Ataxia and sensory was found in 35 patients (36.8%). Land only 6 patients (6.3%) had cognitive abnormalities.

Conclusions: In this study among Chinese ischemic stroke patients with PCI, infarcts involving the proximal territories is most common, but is usually associated with other territories (proximal = distal infarcts are especially common). Visual abnormalities, vertigo and motor weakness are found frequently in all the patients.

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STROKE RECURRENT AND SYMPTOMATIC CAROTID ARTERY OCCLUSION OF ATHEROTHROMBOTIC ORIGIN IN AN OUTPATIENT CLINIC
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Background and purpose: To assess the risk of recurrent ipsilateral ischaemic stroke in patients with Symptomatic Internal Carotid Artery Occlusion (SICAO) of atherothrombotic origin.

Methods: We retrospectively studied all patients seen in our outpatient stroke clinic between 1997 and 2006. 600 patients with an ischemic stroke were seen during this period. We identified patients with first-ever TIA or stroke associated to an unilateral carotid artery occlusion of atherothrombotic origin (angiographically proven) and looked for their long-term outcome.

Results:Twenty-seven patients were identified. Mean age was 57.4 years. 25.9% were females. Hypertension was noted in thirteen patients, hyperlipidaemia in eleven patients and diabetes in seven patients. Five patients had been hospitalised for TIAs and twenty-two for early stroke appropriate to the occlusion. Mean follow-up was 41 months. Follow-up ultrasound data every six months showed only moderate stenosis of the other cervical vessels. The degree of the stenosis of the contralateral internal carotid artery remained stable and inferior to 50% during follow-up period. Nearly all patients had been treated with anti-agregants, except two who had oral anticoagulation because of co-existing atrial fibrillation. For the follow-up period (41 months) no clinical recurrence was noted. 5 patients (18%) developed seizures.

Conclusions: In this small retrospective study, it seems likely that the risk of ipsilateral ischaemic cerebral infarction after SICAO of atherothrombotic origin stabilises after the first neurological event and the medical prevention is efficacious.

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THE RELATION BETWEEN ETHNICITY AND CAROTID ARTERY STENOSIS IN PATIENTS WITH TIA OR ISCHEMIC STROKE
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Background: Previous studies suggest that in patients with ischemic stroke, Whites more often present with large-vessel strokes, whereas Blacks appear to suffer more from small-vessel strokes. In other ethnicities this remains unclear. The aim of this study is to investigate the prevalence of carotid artery stenosis, as a marker for large-vessel disease, in Whites, Blacks, and Asians with stroke.

Methods: In an ambidirectional cohort study 668 patients presenting with TIA or ischemic stroke in the period from January 2003 to January 2005 were included. Medical records were reviewed retrospectively. To determine ethnicity, all patients were contacted by telephone or general practitioners were sent a questionnaire. The presence of stenosis (>50%) in the carotid artery was determined with duplex. Ethnicity was divided into: (i) Whites, (ii) Blacks, (iii) Asians, and (iv) other ethnicities. The relation between ethnicity and carotid stenosis first was analysed univariate. With multivariate analysis, this relation was estimated adjusted for age, gender, hypertension and smoking.

Results: The White population accounted for 65.7%, the Blacks for 9.6%, the Asians for 7.0%, and other ethnicities for 2.7%. In the total group 14.8% (95% CI: 11.9%-17.8%) had a carotid stenosis. A stenosis was observed in 16.3% (95% CI: 12.8%-19.8%) of the Whites, in 9.7% (95% CI: 3.6%-20.0%) of the Blacks, in 9.3% (95% CI: 2.6%-22.1%) of the Asians and in 11.1% (95% CI: 1.4%-34.7%) of other ethnicities. The odds ratio for having carotid stenosis, compared to the Whites as a reference group, was 0.55 (95% CI: 0.23-1.33) for Blacks, 0.53 (95% CI: 0.18-1.52) for Asians, and 0.64 (95% CI: 0.42-0.85) for other ethnicities. After adjustment for age, gender, hypertension and smoking, the odds ratio for having stenosis as a non-White compared to a White patient was 0.44 (95% CI: 0.19-1.02) (P=0.05).

Discussion: In this cohort carotid stenosis, as a marker of large artery stroke, more often occurred in the White population. Not only Blacks, but also Asians had a substantially smaller prevalence of carotid artery stenosis.

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EPIDEMIOLOGY OF STROKE IN A DEPRIVED URBAN COMMUNITY
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Background: Recent stroke epidemiology from England (covering years 2002-2004) suggests that the age-specific incidence of major stroke has fallen in association with reductions in pre-morbid risk factors (Rothwell, Lancet 2004;363:1925-33). We aimed to establish if similar patterns are seen in a socially-deprived urban community in Glasgow, Scotland.

Methods: We ran a hospital-based stroke register for the period of August 2000 to July 2002 that aimed to identify all stroke patients from several postcode areas in East Glasgow. Case ascertainment was through emergency department records, hospital admissions and transfers, outpatient stroke clinics and general clinics and a general practice day hospital. We reviewed 1303 individuals of whom 253 were classified as definite stroke; 479 had no previous cerebrovascular symptoms.

Results: In comparison with the Oxfordshire study there was no significant difference in stroke incidence in the whole population (relative risk of first stroke in Glasgow vs Oxfordshire 1.1; 0.9-1.2). However the Glasgow patients were younger (mean age 68 v 73, P<0.001) with a higher incidence at ages under 65 years (RR 2.0; 1.5-2.7) and a lower incidence at ages over 74 years (RR 0.7; 0.6-0.9). The only significant difference in risk factor prevalence was current cigarette smoking (RR 2.3; 1.7-3.0).

Conclusions: There appear to be substantial differences in the patterns of stroke incidence and smoking prevalence between Oxfordshire and a deprived urban community in Scotland which cannot be explained by differences in study methodology.

21 Epidemiology of stroke

THROMBECTOMY IN ACUTE STROKE USING THE MERCI DEVICE IN FAILED OR CONTRAINDICATED I.V. THROMBOLYSIS
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Background: In about one third of patients treated with i.v. thrombolysis within 3 hours of ischaemic stroke onset no improvement of neurological symptoms has occurred after completed iPA infusion. The outcome of these patients in terms of independence for activities of daily living at three months is severe. An additional treatment approach is required for these patients as well as for those with contraindications for i.v. thrombolysis. We have evaluated the effect of thrombectomy in using the MERCI device in our centre for selected patients.

Methods: The Merci Retriever was recently cleared by the United States Food and Drug Administration (FDA) for the removal of blood clots from patients experiencing an ischemic stroke. When the location of a blood clot has been identified using angiography, the Merci Balloon Guide Catheter is inserted through the femoral artery in the groin. The catheter is manoeuvred up to the clot. Once the clot is captured, it is pulled into the Merci Balloon Guide Catheter and removed.

Results: We have treated 15 patients with failed intravenous thrombolysis, with thrombectomy to thrombolysis and in basilar artery occlusion. Recanalisation was achieved in 14 of 15 patients, for one patient only a narrow opening was achieved after multiple attempts. In two patients, fractions of the clot was lost during removal but disappeared after rt-PA intravenously. No complications such as intracerebral haemorrhage, dissections or wall penetrations occurred. Most patients improved clinically following recanalisation. Independence at 3 months follow up will be reported at the meeting.
22 Epidemiology of stroke

TRENDS IN STROKE OUTCOME RATES IN SOUTHERN GREECE
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Background: Limited data exists regarding trends in stroke outcome rates. We determined stroke survival and disability rates of first-ever stroke in a defined population for the year 2004 and compared these data with those previously reported in 1993-95.

Methods: Identical methods were used to identify and assess all cases of suspected first-ever stroke in the Arcadia province with a population of 81906 residents aged >20 years. Survival rate was measured 1 year after the onset of symptoms. Functional independency was estimated by modified Rankin Scale (mRS) at 1 year (mRS 0,1,2). For case ascertainment, information from death certificates, hospital records, public health centres, and general practitioners was used.

Results: During a 12-month period (2004), 267 subjects with a first-ever stroke were registered. Survival rate at 1 year was 0.601 (95%CI, 0.542-0.660) compared to 0.614 (95%CI, 0.573-0.655) for the years 1993-95 (p=0.71 by log rank test). Ability to look after themselves (mRS score 0,1,2) among survivors has decreased from 69.5% in 1993-95 to 58.1% of 2004 (X2 test, p<0.015). Recurrence rates during the corresponding periods have not changed: 0.049 (95%CI, 0.031-0.067) in 1993-95 to 0.068 (95%CI, 0.038-0.098) for those in 2004 (p=0.25 by log rank test).

Discussion: Our results suggest that the survival and recurrence rates remained unchanged during the 10 year period. The functional independency of those who survived was observed to be significantly decreased.

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PRE-HOSPITAL DELAY TIME IN STROKE ADMISSION IN MALLORCA
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Purpose: Actually a small proportion of stroke patients receive intravenous tPA, mostly because of delay to hospital presentation. Our aim is to analyse factors associated with these delays to perform a community intervention project.

Methods: We prospectively studied 326 consecutive patients admitted to our neurology department between September 2005 and March 2006. We recorded stroke during the year.

Results: Forty-five percent of patients were admitted to the hospital within 3 hours of symptoms onset and 63% within 6 hours. With a median admission time of 780 minutes for those who arrived by their own and 113 minutes if the stroke code was activated. Forty percent of patients were candidates for tPA treatment but only 6% of them received thrombolysis. Delay to hospital admission was response of 60% of them who does not receive treatment. The univariate analysis showed that early admission to hospital was significantly associated with: recognition symptoms, use of emergency services, stroke severity and stroke code activation. A multivariate regression model recognition symptoms and use of emergency services are the independent risk factor for recurrent atherosclerotic stroke. Aim of this study was to investigate whether these strains represent an independent risk factor for recurrent atherosclerotic stroke.

Methods: We performed a longitudinal study of H. pylori positive patients classified as having a list ever atherosclerotic stroke. All patient had a follow-up of 3 years. A first evaluation was made 1 month after enrollment; at this time venous blood was obtained for the evaluation of IgG antibodies to H. pylori and to CagA protein, and for the presence of signs of systemic inflammation. H. pylori negative patients were excluded at this stage. Sera of the remaining patients were frozen, and examined in a blind fashion for anti CagA antibodies at the end of the study. Clinical evaluation or telephone interview were performed at 6-month interval. The primary outcome event for the trial was any fatal or nonfatal stroke after the index stroke.

Results: One hundred seventy H. pylori positive patients were included. According to Kaplan-Meyer survival analysis, CagA positive patients showed a significantly higher risk for stroke recurrence than CagA negative ones (45.6% versus 17.6%; p <.0005 Log Rank test). Difference in the rate of recurrent stroke between CagA positive and negative patients persisted after Cox regression analysis taking into account possible confounding factors (ExpB 3.5; CI 1.9-6.4; p <.0005).

Discussion: Infection with H. pylori CagA positive strains increases the risk of recurrent atherosclerotic stroke. Therefore, seropositivity determination could be performed in order to identify high-risk patients requiring a strict clinical surveillance. The possible beneficial effect of eradication therapy should be evaluated in further studies.

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SEASONAL VARIATIONS OF THE OCCURRENCE OF STROKE IN HUNGARY
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Objectives: The purpose of this study was to analyse the seasonal occurrence of stroke during the year.

Methods: Data derive from the database of the National Health Insurance Fund Administration (OEP), the one and only health care financing agency in Hungary, containing routinely collected financial data for the year 2002. Patients were selected with stroke diagnosis (11 codes) of the International Classification of Diseases (ICD), admitted to acute care hospitals in 2002. We extracted the time of hospital admission from hospital records and patients having more stroke during the year were counted again. Our study provides a nation wide coverage of Hungary for 2002. We calculated the average number of stroke cases (incidence) per month with 95% confidence interval. Statistical analysis as one-way analysis of variance (ANOVA) was carried out with SPSS 14.0.

Results: Altogether N=1290 patients were included into the analysis. The daily number of patient with stroke diagnosis proved to be lowest in September and December with an average 2.39-2.57 cases per day. The highest incidence was observed in January and May with an average incidence of 4.90-4.16 cases per day respectively. Statistical analysis resulted in F=3.676 which is highly significant (p<0.001) value. The weekly peak period of stroke incidence was found on the first day of the week, showing a gradually decreasing tendency all week through, reaching its minimum incidence on Sunday.

Conclusions: The occurrence of stroke showed highly significant seasonal variations within the year 2002 on our nationwide dataset. Results of our study reveal that the incidence of stroke shows a characteristic rhythm with respect to seasons and the days of the week, which should be considered in the development of preventive concepts.

Stroke and infections

1 Stroke and infections

CYTOTOXIN-ASSOCIATED GENE-A-POSITIVE HELICOBACTER PYLORI STRAINS ARE ASSOCIATED WITH RECURRENT ATEROSCLEROTIC STROKE
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Background: H. pylori infection, especially strains bearing the cytotoxic-associated gene-A (CagA), has been found to be associated with “de novo” atherosclerotic stroke. Aim of this study was to investigate whether these strains represent an independent risk factor for recurrent atherosclerotic stroke.

Methods: We performed a longitudinal study of H. pylori positive patients classified as having a list ever atherosclerotic stroke. All patient had a follow-up of 3 years. A first evaluation was made 1 month after enrollment; at this time venous blood was obtained for the evaluation of IgG antibodies to H. pylori and to CagA protein, and for the presence of signs of systemic inflammation. H. pylori negative patients were excluded at this stage. Sera of the remaining patients were frozen, and examined in a blind fashion for anti CagA antibodies at the end of the study. Clinical evaluation or telephone interview were performed at 6-month interval. The primary outcome event for the trial was any fatal or nonfatal stroke after the index stroke.

Results: One hundred seventy H. pylori positive patients were included. According to Kaplan-Meyer survival analysis, CagA positive patients showed a significantly higher risk for stroke recurrence than CagA negative ones (45.6% versus 17.6%; p <.0005 Log Rank test). Difference in the rate of recurrent stroke between CagA positive and negative patients persisted after Cox regression analysis taking into account possible confounding factors (ExpB 3.5; CI 1.9-6.4; p <.0005).

Discussion: Infection with H. pylori CagA positive strains increases the risk of recurrent atherosclerotic stroke. Therefore, seropositivity determination could be performed in order to identify high-risk patients requiring a strict clinical surveillance. The possible beneficial effect of eradication therapy should be evaluated in further studies.

2 Stroke and infections

THE LEVEL OF ISCRP AT CHRONIC PHASE OF STROKE IS HIGHER IN PATIENTS WITH INTRACRANIAL ARTERIAL DISEASE THAN THOSE WITH OTHER ARTERIAL DISEASE PATTERNS
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C-reactive protein (CRP) has been recently identified as a novel risk marker in stroke. However, few studies have analyzed the relationship between the CRP and specific stroke subtypes and arterial disease patterns assessed by MRI and MRA. We investigated the role of inflammation and endothelial activation according to different stroke subtypes and arterial disease patterns. We consecutively included stroke patients in chronic (>3 months) stage and classified the stroke subtypes to large vessel disease (LVD), small vessel disease (SVD), cardioembolism (CE), and intracerebral hemorrhage with MRI and angiographic findings. Arterial disease patterns according to the vessel studies were arbitrarily defined as intracranial disease (IC dz), extracranial disease (EC dz), no large vessel disease (no LVD) and IC dz
with EC dz regardless of the stroke subtype. Age and sex matched controls were included (n=21). High-sensitivity CRP (hsCRP), intercellular adhesion molecule, vascular cell adhesion molecule, and E-selectin were tested in the patients and controls. Among total 401 patients, LVD was most common (43.6%), followed by SVD (29.9%) and CE (15.0%). All markers were not different among stroke subtypes. Regarding arterial disease patterns, 50% of patients had no LVD, 32% had IC dz, 10.6% had both IC dz and EC dz, and 7% had EC dz. The hsCRP level was significantly higher in patients with IC dz than in those with other arterial patterns (not LVD, EC) after adjusting for diabetes mellitus and use of statin (Odds ratio 2.94, 95% CI 1.15-7.54, p=0.025). The E-selectin level was also higher in patients with IC dz than in the control group (p=0.048). In conclusion, the higher hsCRP levels and E-selectin in patients with IC dz suggests that inflammation may play a more significant role in IC dz than in other arterial disease patterns in stroke patients.

3 Stroke and infections

**EFFECT OF TNF-ALPHA ON PLATELET GLUTAMATE UPTAKE IN STROKE PATIENTS**

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**Background:** Inflammation and excitotoxicity play important roles in the pathophysiology of ischemic brain damage. In previous studies we have shown a prolonged TNF-alpha (TNF-a) release, a long lasting high glutamate (glu) plasma concentration and an impaired platelet (plt) glu transport up to 3 months after the symptoms onset. Since high persisting plasmatic levels of TNF-a have been detected in stroke patients, we aimed to determine whether TNF-a administration could be sufficient to cause a defective plt glutamate uptake.

**Methods:** Human blood plt were selected as a peripheral model of glutamate transport. 10 stroke patients and 20 control subjects were enrolled to test [H3]glu uptake after stimulation with increasing doses of TNF-a (10, 20 and 40ng/ml).

**Results:** Pit from healthy subjects displayed a dose related reduction of glu uptake after TNF-a stimulation (total glu uptake decrease -35%). The reduction was less extensive in plt from stroke patients, possibly due to the demonstrated higher levels of plasmatic TNF-a in patients affected by stroke.

**Discussion:** We showed that in-vitro administration of high concentration of TNF-a is able to effectively reduce glu uptake in human plt. The results suggest that the increase in plasmatic TNF-a in stroke patients may be responsible for the demonstrated reduction of plt glu uptake. Since decreased plt glu uptake could result in increased plasmatic glu levels, which in turn may generate a possible excitotoxic damage, pharmacological modulation of TNF-a levels might be helpful in the management of cerebrovascular patients.

4 Stroke and infections

**INCREASED LEVEL OF C-REACTIVE PROTEIN (CRP) AT ONSET OF ACUTE ISCHEMIC STROKE CORRELATES WITH ELEVATION OF LEUKOCYTE ANTI-SEDIMENTATION RATE AND S100B AND PREDICTS OUTCOME**

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**Background:** Patients with stroke are more susceptible to bacterial infections, which is the leading cause of death in stroke. The innate immune system, especially leukocytes, provides an acute defense against infections. Leukocyte anti-sedimentation rate (LAR) is a specific test to detect early activation of leukocytes. Here, we examined LAR, CRP and S100B in patients within hours after onset of acute ischemic stroke (AIS) to characterize the innate immune response and its relation to the outcome.

**Methods:** Venous blood samples were taken serially for measurement of LAR, S100B, C-reactive protein (CRP) and procalcitonin (PCT) within 6 hours after onset of first symptoms (T0), at 24 (T24) and 72 hours (T72). After 24 hours, the enrolled patients were categorized into a definitive ischemic stroke based on the clinical and transcranial Doppler findings in the territory of the left media cerebral artery. The transcranial Doppler disclosed a stenosis in this artery, as well as in distal vertebral arteries, confirmed by angiography. Lumbar puncture showed an inflammatory cerebrospinal fluid. Blood cultures from Brucella were negative but high titres of IgG antibodies were found (serum agglutination and ELISA assay No other abnormality was found in etiologic investigation. Lumbar puncture showed an inflammatory cerebrospinal fluid. Blood cultures from Brucella were negative but high titres of IgG antibodies were found (serum agglutination and ELISA assay No other abnormality was found in etiologic investigation. Lumbar puncture showed an inflammatory cerebrospinal fluid. Blood cultures from Brucella were negative but high titres of IgG antibodies were found (serum agglutination and ELISA assay No other abnormality was found in etiologic investigation. Lumbar puncture showed an inflammatory cerebrospinal fluid. Blood cultures from Brucella were negative but high titres of IgG antibodies were found (serum agglutination and ELISA assay No other abnormality was found in etiologic investigation. Lumbar puncture showed an inflammatory cerebrospinal fluid. Blood cultures from Brucella were negative but high titres of IgG antibodies were found (serum agglutination and ELISA assay No other abnormality was found in etiologic investigation. Lumbar puncture showed an inflammatory cerebrospinal fluid. Blood cultures from Brucella were negative but high titres of IgG antibodies were found (serum agglutination and ELISA assay No other abnormality was found in etiologic investigation. Lumbar puncture showed an inflammatory cerebrospinal fluid. Blood cultures from Brucella were negative but high titres of IgG antibodies were found (serum agglutination and ELISA assay No other abnormality was found in etiologic investigation. Lumbar puncture showed an inflammatory cerebrospinal fluid. Blood cultures from Brucella were negative but high titres of IgG antibodies were found (serum agglutination and ELISA assay No other abnormality was found in etiologic investigation. Lumbar puncture showed an inflammatory cerebrospinal fluid. Blood cultures from Brucella were negative but high titres of IgG antibodies were found (serum agglutination and ELISA assay No other abnormality was found in etiologic investigation. Lumbar puncture showed an inflammatory cerebrospinal fluid. Blood cultures from Brucella were negative but high titres of IgG antibodies were found (serum agglutination and ELISA assay No other abnormality was found in etiologic investigation. Lumbar puncture showed an inflammatory cerebrospinal fluid. Blood cultures from Brucella were negative but high titres of IgG antibodies were found (serum agglutination and ELISA assay No other abnormality was found in etiologic investigation. Lumbar puncture showed an inflammatory cerebrospinal fluid. Blood cultures from Brucella were negative but high titres of IgG antibodies were found (serum agglutination and ELISA assay No other abnormality was found in etiologic investigation. Lumbar puncture showed an inflammatory cerebrospinal fluid. Blood cultures from Brucella were negative but high titres of IgG antibodies were found (serum agglutination and ELISA assay No other abnormality was found in etiologic investigation. Lumbar
Acute stroke: early management and stroke units

1 Acute stroke: early management and stroke units

THE IMPACT OF ACUTE STROKE UNIT TREATMENT ON LONG TERM SURVIVAL
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Background and purpose: Limited data exists on long term survival of patients managed in an acute stroke unit (ASU) and received minimal hospitalization and short in-hospital rehabilitation. The aim of the present study was to examine the effects of ASU management on stroke survival during a 10 year period compared to that of the general medical ward (GMW).

Methods: A randomized controlled trial was performed on 617 patients with acute first ever stroke over a period of 3 years. Three hundred and nine subjects (309) were allocated to our ASU and three hundred and eight (308) to the GMW. Patients were followed up yearly during a 10 year period or until death using the modified Rankin Scale. The proportion of survival was the main outcome measure. Statistical analysis was performed using the Kaplan-Meyer method and log rank test.

Results: Mean age of patients treated in the ASU was 70.5±11.1 years and 70.8±12.5 for those treated in the GMW. There were no significant differences observed in the baseline characteristics between the groups regarding risk factors, neurological severity on admission and major stroke subtypes. Mean length of hospitalization was 11.23±5.30 and 12.10±7.49 days for patients treated in ASU and GMW, respectively (p=0.121). Patients managed in the ASU had a better survival compared to those in the GMW from 2 weeks up to 6 years. No statistical differences were seen thereafter. Proportion of survival by log rank test for ASU and GMW was: 2 years 85.1% vs 78.9% (p=0.04), 1 month 82.2% vs 73.15% (p=0.007), 1 year 66.3% vs 58.8% (p=0.03), 6 years 41.1% vs 35.4% (p=0.04), 7 years 35.6% vs 32.8% (p=0.14) and 10 years 26.5% vs 25% (p=0.28) respectively.

Conclusions: Our results indicate that the management of patients with an acute stroke event for a relatively short time in an ASU with this profile improves survival for a prolonged period of time 6 years while the benefit is lost thereafter.

2 Stroke and infections

INFECTION AND IL-6 ARE INDEPENDENT RISK FACTORS FOR A POOR FUNCTIONAL OUTCOME FROM ISCHEMIC STROKE
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Background: Infections cause an inflammatory response that may activate the endothelial cells lining blood vessels. Infections affect stroke outcome but the mechanisms have not been elucidated. Our hypothesis is that inflammation due to infections may increase endothelial cell activation, causing prothrombotic changes in coagulation, thereby causing more severe strokes.

Methods: People suffering an ischemic stroke in the last 72 hours (n=85) were recruited. Information on infections was collected from patient notes. ELISAs were used to measure plasma markers of endothelial cell activation, inflammation and coagulation.

Results: 32% of people with an acute stroke had an infection in the 7 days post stroke. There were no differences in characteristics of the groups, except that 77% of people without an infection took aspirin compared with 46% of people with an infection (p=0.005). Infection, in particular pneumonia, was related to the subclass of stroke (OCSP) (p=0.036, with more TACS and fewer LACS in the infection group). There was a trend for those with an infection to have a larger infarct in stroke contrary to TIA, where activation of leukocytes is delayed and transient.

Acute stroke: early management and stroke units

SHORTENING “DOOR-TO-TELEMEDICINE” TIME IN A RURAL TELEMEDICINE NETWORK THROUGH WIRELESS TELECONSULTATION – VIDEOBASED TELEMEDICINE INFORMATION SYSTEM (VITIS)
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Background: Telemedicine for stroke in suabia (TESS) was the first project to improve stroke care in rural community hospitals in Bavaria since 2001. Few of the patients reached their hospital much ahead of the 3 hour window of the consultation. To avoid further delay of the consultation by the consultant driving to reach the telemedicine terminal, we set up a mobile telemedicine videoconference system. The project is part of the German stroke competence network, funding is provided by the German ministry of education and science.

Goal: To provide for a high quality, round-the-clock and quick stroke-consultation to improve thrombolysis rates even further than wired telemedicine equipment could.

To test several wireless networks availability, quality of service, bandwidth and the resulting quality of video and audio data transmitted.

Equipment: Partner hospitals were equipped with notebooks, webcams and room remote steering, room microphones and a LAN-access cable. The consultants got small notebooks or tablet computers with a headset to communicate, integrated WLAN chipsets, integrated broadband mobile phone cards, and a LAN-access cable.

Results: Even in a rural environment, wireless networks are readily accessible. Teleconference could therefore start reasonably earlier. Mobile telemedicine with a wireless videoconference system can then yield to higher thrombolysis rates in rural hospitals.

Quality of video and audio data transmitted was depending much upon the bandwidth of the connection established. Regularly, it was still better than in the standard system used beforehand, since a DSL-line or WLAN-hotspot could be reached quickly and easily in most instances. UMTS mobile phone connections’ quality depended much upon usage and location, since network cells are small and crowded at times.

Outlook: Future development of higher bandwidths, quality of service, range and...
Acute stroke: early management and stroke units

**APPROXIMATION OF BODY WEIGHT USING AN ANTHROPOMETRIC MODEL: VALIDATION IN ACUTE STROKE PATIENTS AND COMPARISON WITH PHYSICIAN’S ESTIMATIONS**

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**Background:** Patients with acute stroke often are aphasic or present with an impaired level of consciousness and are not able to report their body weight (BW). However, BW is indispensable for accurate dosage of thrombolytic agents. Estimation of BW in the emergency situation by physicians is known to be imprecise presumably leading to either over- or underdosage of rt-PA in a number of cases. In this study, we developed an anthropometric model to approximate patients’ BW from easy to obtain body measures and compared it with physicians’ estimations in an independent cohort of acute stroke patients.

**Methods:** Using the community based prospective dataset of the Carotid Atherosclerosis Progression Study (CAPS) including 6954 individuals, we calculated a linear regression model to determine BW from three anthropometric measures (body height, hip circumference, waist circumference) and age and gender. All these parameters were independent determinants of BW. We then validated this model in a prospective study on 178 consecutive stroke patients (mean age 67.1 ± 16.4, 49% females). The approximated BW was compared with the “true” BW as measured by scales and with two independent estimations (1, 2) of BW by physicians.

**Results:** The mean difference between the “true” BW and the approximated BW using the anthropometric model was 3.2 ± 2.6 kg. The difference between the “true” BW and the estimated BW was significantly higher (6.5 ± 5.3 kg for estimation 1, 7.4 ± 5.7 kg for estimation 2, p < 0.001 for each comparison). Using the anthropometric method, BW of 12 patients was calculated with a >10% difference from true BW, and of 1 patient with a >20% difference. The corresponding values for physicians’ estimation 1 were 56 and 8 and for estimation 2 72 and 15, respectively.

**Conclusion:** Approximation of BW in acute stroke patients using an anthropometric method is superior to estimation by stroke physicians. This easy to use method provides a precise and standardised procedure for acute stroke patients who cannot report their actual BW and may help to avoid dosage errors in rt-PA treatment.

**Acute stroke: early management and stroke units**

**TIME COURSE OF HEMORRHAGIC TRANSFORMATION IN ACUTE ISCHEMIC STROKE EVALUATED BY TRANSCRANIAL ULTRASOUND**

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**Background:** We conducted this prospective study to evaluate the time course of hemorrhagic transformation (HT) in the early phase of ischemic stroke using transcranial ultrasound. This non-invasive bedside method offers the possibility of detecting the small cortical HT (sensitivity 90.9%, specificity 97.2%). The time course of the development of HT was dependent on tissue plasminogen activator (TPA) treatment (20/58). HT was detected in the first 60 h in 22 patients. Reopening occurred earlier in TPA treated patients (14/22) compared to 33.3% without thrombolysis (HT in 8/20) to 33.3% without thrombolysis (HT in 12/38). MCA occlusion (M1-segment) was present in 22 patients. Reopening occurred earlier in TPA treated patients (14/22) compared to 33.3% without thrombolysis (HT in 8/20). MCA occlusion (M1-segment) was present in 22 patients. Reopening occurred earlier in TPA treated patients (14/22) compared to 33.3% without thrombolysis (HT in 8/20) to 33.3% without thrombolysis (HT in 12/38).

**Discussion:** TCS is unable to detect the small cortical HT (sensitivity 90.9%, specificity 97.2%). All these parameters were independent determinants of BW. We then validated this model in a prospective study on 178 consecutive stroke patients (mean age 60.6 ± 14.9 years, 22 female) with acute ischemic stroke using transcranial sonography (TCS) and the basal cerebral arteries using transcranial color-coded sonography (TCCS). Follow-up investigations were done up to 7 days. Lesion size and localization were determined by CTT. The evaluation of the TCS scans was performed without any knowledge of clinical or imaging information offline after the investigation by an experienced investigator.

**Results:** 20 out of 22 patients with HT displayed by CCT could be identified by TCS. In one patient TCS provided a wrong positive result and in another two patients TCS was unable to detect the small cortical HT (sensitivity 90.9%, specificity 97.2%). The time course of the development of HT was dependent on tissue plasminogen activator (TPA) treatment (20/58). HT was detected in the first 60 h after symptom onset in 62.5% of patients treated with TPA (HT in 8/20) compared to 33.3% without thrombolysis (HT in 12/38). MCA occlusion (M1-segment) was present in 22 patients. Reopening occurred earlier in TPA treated patients (14/22) compared to TPA treated patients (8/22) in the first 60 h after symptom onset: 71.4% vs. 37.5% respectively. There was a significant correlation between time of MCA reopening and HT detection (R=0.13, Wilcoxon Test, p=0.035).

5 Acute stroke: early management and stroke units

**RENAL FUNCTION AND OUTCOME AMONG THROMBOLYSED STROKE PATIENTS**

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**Objective:** To evaluate the prognostic value of renal function and other predictive variables ascertained prior to thrombolysis of acute stroke patients.

**Background:** Many prognostic factors determining outcome for stroke patients receiving thrombolysis are known from controlled trials but much less is known from currently measured laboratory findings.

**Methods:** Initial clinical characteristics (i.e. demographic data, NIH stroke scale (NIHSS), time to thrombolysis, risk factors, blood pressure, temperature, antithrombotic pretreatment) and early laboratory results (i.e. glucose, c-reactive protein, creatinine, INR, platelet count) were compared with the outcome variables “good” (mRS 0-2) vs. “poor outcome” (mRS 3-6) after 3 months. For categorical variables, odds ratios (OR) with 95% confidence intervals were calculated. For continuous variables, T-tests were used.

**Results:** 196 patients received rt-PA between June 1998 and July 2006. Outcome was “good” in 115 (59%) patients, “poor” in 81 (41%), incl. 26 death. Higher NIHSS (mean 16.1 versus 12.0; p<0.001), older age (mean 71.5 versus 63.4 years, p<0.001), history of diabetes (OR 2.90 (1.21, 6.94)), coronary heart disease (OR 2.29 (1.13, 4.63)), and increased creatinine levels (mean 98.4 versus 82.7 mmol/l; p=0.006) were associated with “poor” outcome. Likewise, the creatinine clearance was lower in the “poor” outcome group compared to the “good” outcome group (mean 64.5 versus 93.9 mmol/l; p=0.002). After adjustment for age, every increase of creatinine by 10 mmol/l increased the odds for a “poor” outcome by 10% (95% CI 0.2–0.7%).

**Conclusions:** Impaired renal function, indicated by increased creatinine levels or decreased creatinine clearance, correlates with “poor” outcome.

6 Acute stroke: early management and stroke units

**EARLY MOBILISATION OF ACUTE STROKE PATIENTS IS TOLERATED WELL, INCREASES MEAN BLOOD PRESSURE AND OXYGEN SATURATION AND IMPROVES LEVEL OF CONSCIOUSNESS**

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**Background:** Early mobilisation/EM is regarded a key factor in stroke units(SU), but benefits and risks of EM are still discussed. The aim of the present study was to record EM’s effect on mean blood pressure(MBP), oxygen saturation(SO2-sat), heart rate(HR), level of consciousness(LOC) and neurological deficits(ND) assessed by Scandinavian Stroke Scale(SSS).

**Methods:** Patients admitted to our SU within 24 h of symptom-onset with mod. to severe stroke (SSS: 2-52) were included. Standardised monitoring was performed during the first EM out of bed, and MBP, SO2-sat, HR, LOC were obtained before, after sitting up in bed, standing for 1 min, sitting in a chair for 5, 10 and 55 min, on return to bed. SSS was performed before and after EM. EM was stopped, if increased symptoms, systolic BP(SBP) > 220 mmHg or drop in SBP>30 mmHg. A total of 100 patients were included with the following: Mean SSS: 30, mean age: 77, reduced LOC: 34%, cerebral hemorrhage: 8%, infarction: 92%. EM was initiated on average 25 h after symptom-onset (9-55 h). EM was discontinued for 14 patients due to dizziness/vomiting and/or transient reduction in LOC (3 pts), SBP>220 mmHg (4 pts.) or a drop in SBP>30 mmHg (7 pts.).

**Results:** The main outcome for the 86 patients who fulfilled the entire EM-procedure were:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Before EM</th>
<th>Max during EM</th>
<th>Min during EM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg. MBP(mmHg)</td>
<td>108.2</td>
<td>112.7**</td>
<td>107.6</td>
</tr>
<tr>
<td>Avg. O2-sat(%)</td>
<td>95.7</td>
<td>97.1***</td>
<td>96.4*</td>
</tr>
<tr>
<td>Avg. HR (beats/min)</td>
<td>70</td>
<td>81***</td>
<td>72*</td>
</tr>
</tbody>
</table>

*p<0.05, **p<0.01, ***p<0.001 compared to status before EM

LOC assessed by SSS was significantly improved during EM. None of the patients had an increase in ND.

**Discussion:** EM seems to be a safe procedure with possible beneficial effects due to increased oxygen saturation, transient elevation of MBP and improvement of mental alertness. While 86% of the patients tolerated EM well, 14% had to discontinue EM due to unstable BP or transient increase of symptoms. These patients were identified by clinical assessment and repeated BP measurements.
7 Acute stroke: early management and stroke units

FACILITIES AVAILABLE IN FRENCH HOSPITALS TREATING ACUTE STROKE PATIENTS
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Dept. of Neurology, University of Lille, Lille, France

Background: stroke centres decrease mortality and handicap, but a recent survey has shown that half of European hospitals do not provide the minimum level of care acceptable for stroke patients, with huge disparities between countries. Objective: to describe facilities available in a random sample of 121 French hospitals treating acute stroke patients, and to evaluate the proportion of hospitals meeting criteria for primary (PSC) stroke centres. Method: we used definitions derived from an expert survey for comprehensive stroke centres (CSC), PSC, and minimum level for any hospital ward (AHW) admitting acute strokes. We determined the proportion of hospitals meeting those criteria, facilities available, and compared with the other European countries. Results: randomly selected hospitals treated approximately 25% of all strokes that occurred in France in 2005. Only 1.7% met criteria for CSC or PSC, and 80.2% did not even meet criteria for AHW. Many facilities considered as absolutely necessary by experts were less available in France than in other European countries, especially regarding personnel, brain CT-scan, ECG monitoring and use of rt-PA protocols. French hospitals have more availability of CT angiography 24/7 and air ambulance, however, these were not considered as absolutely necessary for stroke care by experts. Conclusion: in France, very few stroke patients are treated in hospitals with optimal facilities. As availability of facilities does not necessarily grant their use, only a small proportion of acute stroke patients have access to an appropriate level of care in France. Overall, France is below the average European standards for stroke care.

8 Acute stroke: early management and stroke units

PREHOSPITAL PREDICTORS FOR STROKE UNIT ADMISSION AND THROMBOLYSIS THERAPY
Versailles Hospital, Mobile Intensive Care Unit, Le Chesnay, France

Objective: The goal of this study was to bring to view conditions related to Stroke Unit Admission (SUA) and Thrombolysis Treatment (TT) for stroke victims examined by Mobile Intensive Care Units (MICU).

Methods: 457 acute stroke suspicions with a NIHSS score notified during pre-hospital management were included between January 2004 and December 2006. The independent impact of factors related to SUA and TT identified by univariate testing was measured through multivariate analysis. The independent impact of factors related to SUA and TT identified by univariate testing was measured through multivariate analysis. The independent impact of factors related to SUA and TT identified by univariate testing was measured through multivariate analysis.

Results: Out of 457 patients, figured 186 SUA (41%) and 53 TT (12%). The testing was measured through multivariate analysis. The independent impact of factors related to SUA and TT identified by univariate testing was measured through multivariate analysis. The independent impact of factors related to SUA and TT identified by univariate testing was measured through multivariate analysis.

Discussion: Age influences SUA but not TT. Arm paresis is the only neurological defect independently linked to SUA but not to TT. SBP is related to TT but not to SUA. The two main determinants for both SUA and TT are symptom delay and NIHSS score. Theses results point out the major role of race against time and NIHSS scoring performed “on the field” by MICU teams for acute stroke patients.

9 Acute stroke: early management and stroke units

CORRELATION BETWEEN EARLY TCCD, PERFUSION CT AND FINAL IRM LESION IN PATIENTS WITH ACUTE STROKE UNDERGOING THROMBOLYSIS
Geneva University Hospital, Geneva, Switzerland

Purpose: Transcranial Colour Doppler (TCCD) ultrasound is a useful tool for assessment of (middle cerebral artery) MCA patency in acute ischemic stroke (AIS) patients. Further, perfusion-CT (PCT) imaging has been shown to predict stroke location and size of ischemic cerebral parenchyma not definitively compromised. We correlated the residual MCA flow (TIBI classification) with the extent of the PCT deficit prior to thrombolysis and with the extent of final MRI lesion.

Patients and Methods: Consecutive AIS patients with MCA occlusion were sub-

cluded from 26 patients. Patients with TIBI grades 0-1 (n=14) have a significantly greater MTT in comparison with patients with TIBI grades 2-3 (p<0.05). No significant difference was found in the extent of the final MRI lesion between patients with low (0-1) or higher (2-3) TIBI grades prior to thrombolysis.

Conclusions: Although the number of patients was small, our findings suggest nevertheless that TIBI grades prior to thrombolysis correlate with perfusion deficit but does not seem to predict the extent of the final MRI lesion. Patients with early recanalisation (0-30 minutes) had a tendency to have smaller lesions on MRI.

10 Acute stroke: early management and stroke units

THE IMPACT OF CENTRALISING STROKE SERVICES TO A SITE SEPARATE FROM THE EMERGENCY DEPARTMENT
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Introduction: Until recently there was a Stroke Unit (SU) based at each of Leicester’s 3 acute hospitals. Stroke services have now been centralised to a single site, geographically separated from the Emergency Department (ED) by 3 miles. Patients are either admitted directly using an ambulance protocol or via ED. We examined the impact of this relocation on patients presenting to ED with acute stroke.

Methods: Data was taken from the local Stroke Register for a 6-month period before and after relocation, which occurred in Jan 06. Variables compared included mortality rates, admission to a SU, and the time to transfer, neuro-imaging, consultant review, swallowing assessment and therapist intervention. Chi-squared analysis was used to compare each factor before and after relocation.

Results: A total of 676 patients were admitted, 242 of which were via ED prior to relocation, and 201 via ED afterwards. The remainder were directly admitted to SU. Patients admitted via ED had an increased mortality of 11.6% (43/242 versus 59/201, p<0.01) following relocation, and the proportion of patients admitted to SU from ED fell by 27.7% (209/242 versus 118/201, p<0.001). Transfer time to SU was also longer, the proportion of patients arriving within the first 48 hours falling by 14.7% (183/209 versus 86/118, p<0.001). Overall mortality for all patients with acute stroke admitted via any source increased by 7.7% (70/838 versus 76/293, p<0.05). For patients admitted via ED, the proportion seen by a physiotherapist within 72 hours fell by 12.7% (160/188 versus 70/98, p<0.01), and those seen by an Occupational Therapist within 1 week fell by 36.1% (89/122 versus 21/57, p<0.001).

Conclusions: Despite recent centralisation, a significant number of patients with acute stroke still present to ED. Overall mortality has increased, most significantly in patients admitted via ED. This may be due to the reduction in the proportion of patients being managed on SU, and the associated delay in transfer and therapist intervention following relocation.

11 Acute stroke: early management and stroke units

AGREEMENT IN DYSPHAGIA DETECTION: A REPRODUCIBILITY STUDY IN ACUTE STROKE PATIENTS
M.G. Celani, E. Righetti, A. Tuì, A. Sgoifo, L. Amendola, D. Capeccchi, L. Guerra, C. Ottaviani, M.G. Scucchi, S. Ricci
UOC Neurologia e Ictus, Ospedale Città della Pieve, USL 2 dell’ Umbria, Città della Pieve (PG), Italy

Background: Up to half of acute stroke patients have dysphagia, which precludes safe fluid ingestion. A standard clinical assessment of dysphagia, (using the Bedside Swallowing Assessment) is recommended in all patients with acute stroke; if available, more sensitive and specific instrumental techniques can be utilised in selected centres. However, the reproducibility of this evaluation by nurses has not
been studied. Our aim was to test interobserver agreement in diagnosing dysphagia in a consecutive series of stroke patients.

**Material and methods:** when a patient with acute stroke was admitted to our SC, the nurse in charge, as a part of routine evaluation, administered a BSA, and registered the results. After a special form; when a different nurse began to work (not later than 8 hours from the first evaluation), he or she repeated the test, being blind on the opinion of the former colleague, and reported the results on a new form. Each patient was categorised in two ways: 1) presence or absence of dysphagia; 2) severity of dysphagia (4 grades, from no dysphagia to severe dysphagia). Data were stored by another member of the stroke team, registered on a database, and analysed with K statistics.

**Results:**Until now, 886 evaluations are available. The mean time interval between the 2 BSAs was 3h10m. Nurses agreed on 80 cases for 1st categorisation; K was 0.81 (95% CI 0.68 to 0.93). However, agreement was lower for severity of dysphagia: unweighted K 0.65, 95% CI 0.51 to 0.79; linear weighted kappa 0.71 (95% CI 0.58 to 0.84); clinically weighted K 0.64 (95% CI 0.62 to 0.66).

**Conclusion:** The diagnosis of dysphagia vs normal swallowing is reproducible, but agreement is slightly worse when severity of dysphagia is taken into account; since this parameter is used to choose the way the patient is fed (i.e. different levels of thickening of foods vs NG tube), specific training to nurses dealing with acute stroke patients is warranted.

**12 Acute stroke: early management and stroke units**

**ADVANTAGES OF PERFORMING ECHOCARDIOGRAPHY DURING THE HYPERACUTE PHASE OF STROKE**

Hospital Vall d’Hebron, Barcelona, Spain

It has been estimated that cardiogenic emboli are a source of transient ischemic attack or stroke in up to 40% of all cases. Cardiological study work-up includes an echocardiography study, although it is mostly performed during subacute phase or even during outpatient control. Our aim was to study the advantages of performing second harmonic transthoracic echocardiography (SHTTE) during the hyperacute phase of an ischemic stroke.

**Methods:** We prospectively studied all ischemic stroke patients admitted at our Stroke Unit from November 2006 to January 2007. All these patients were classified following TOAST criteria. We selected those patients with a known cardiobolic source (atrial fibrillation, isquemic cardiopathy with a low function, mechanic prosthesis and dilated miocardiopathy) and with an undetermined origin; all were underwent a SHTTE within the first 24 hours.

**Results:** 68 patients were performed a SHTTE, 17 (25%) classified as cardiobolic and 51(75%) as of unknown origin. After the complete study, 37%(n=19) of the patients initially classified as undetermined, the diagnostic was changed to cardiobolic: 8 showed an atrial fibrilation during ECG-monitoring, 6 (31.5%) a severe aortic arch arteriathrosis, 4 (21%) a severe aynxia of ventricular wall and in one patient a severe right-to-left shunt. In the other 32 patients, the diagnostic remained as undetermined. After the evaluation of risk factors, the only difference found was in smoking (more prevalent in the undetermined group). There were no important differences among the echocardiographic measures except for the left atrial area (27,42 - cardiobolic - vs 20,64 - undetermined -; p=0,039) and the left ventricular function (40.25 –cardiobolic- vs 58.38 –undetermined –; p=0,001).

Finally, the echocardiographic findings allowed a change in antithrombctic therapy in 18 (15.7%) patients during the hyperacute phase.

**Conclusion:** SHTTE is a very useful tool during the hyperacute phase of an ischemic stroke, allowing a choice of the best prevention treatment since the stroke onset.

**13 Acute stroke: early management and stroke units**

**BIOMARKERS FOR DIAGNOSIS OF ACUTE STROKE**

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Evangelisches und Johanniter Klinikum Niederrhein, Duisburg, Duisburg, Germany

**Background:** Until now, the test of single biomarkers of peripheral blood for the diagnosis of a stroke has not been successful in clinical terms. A commercially available test system could be helpful for the acute diagnosis of stroke.

**Methods:** Blood samples were investigated from 70 consecutive patients who had been admitted with clinical symptoms of an acute stroke to the stroke unit of an intensive care hospital and in whom a stroke could be demonstrated by a brain scan. As a control, 70 acutely ill neurological patients were chosen who exhibited neither clinical symptoms nor imaging evidence of a stroke. The samples were analyzed within one hour upon admission by the Triage® Stroke-Panel test system using the Triage MeterPlus (Biosite Inc., San Diego, CA, USA) instrument.

**Results:** The stroke group had a significantly higher MMX value (mean 4.6; median 4.9; standard deviation 1.73) than the control group (mean 2.9; median 2.9; standard deviation 1.89) (p<0.001). Following correction for age and sex using multivariate analysis of variance, an average MMX value of 4.3 (95%CI: 4.0–4.8) was obtained in the case of the stroke group compared with an average MMX value of 3.0 (95%CI: 2.6–3.4) for the control group (p<0.05).

A MMX value of ≥4.0 was observed in 53/70 of the stroke patients and 23/70 of the controls, affording a sensitivity of 0.757 and a specificity of 0.671 for stroke diagnosis.

**Conclusions:** The calculated MMX value is elevated in patients with confirmed stroke compared to other acutely ill neurological patients. The use of the investigated test system could be helpful for the acute diagnosis of stroke.

**Chronic conditions and recurrences**

**1 Chronic conditions and recurrences**

**INCIDENCE OF FRACTURE AFTER ISCHAEMIC STROKE AND USE OF PREVENTATIVE THERAPIES**

University of Aberdeen, Aberdeen, United Kingdom

**Background:** Fractures are an important complication after stroke. Predisposing factors include loss of bone mass in the paretic side and the propensity of patients to falls. The purpose of this study was to investigate the incidence and timing of fracture after stroke in a local population, and to assess the use of fracture preventative therapies. We also aimed to identify any predictors for fracture in our population.

**Methods:** A local stroke database has been in operation since 1998. Anonymous data for 4455 patients admitted between 1998 and 2005 was available. The median age of the patients was 74 years (IQR 17 years, min 16, max 101y), and 52% were male. Demographic data was retrieved from the database, and information on fractures obtained from the discharge register of hospitals in the catchment area, supplemented by a search of the inpatient and outpatient radiological database prior to anonymisation.

**Results:** 3% (142) of patients had sustained 180 fractures, giving an incidence rate of 5 per 1000 patient-years. The median time to post-stroke fracture was 1year (IQR 2years). Patients with fracture had a median age of 73 years (IQR 19 years) compared to 74y (IQR 17 years)(Mann Whitney test, p= 0.696). 52% (92) of the fractures affected the hip (femur neck and trochanter). In patients with hemiparesis at the time of fracture, 60% had their fracture on the paretic side and 83% of the fractures were related to falls. Fracture prevention therapies were underutilised with only 5% of patients with fracture having had treatment for osteoporosis after their stroke.

**Discussion:** Although infrequent, fracture remains an important complication of stroke, and falls remain an important cause of fracture. Thus prevention of falls is an important therapeutic target in these patients, along with efforts to prevent disuse osteopenia. Fracture prevention therapy is underutilised in this high risk population.

**2 Chronic conditions and recurrences**

**ASPIRIN RESISTENCE: MONITORING OF ASPIRIN’S ANTI-AGGREGATORY EFFECTS IN 110 STROKE PATIENTS**

Medical University Vienna, Vienna, Austria

**Background:** Long-term antiplatelet therapy (aspirin 100mg/d) avoids 36 serious ischemic events for every 1000 stroke patients treated for three years. However, aspirin resistance was reported in up to 60% of patients. A retrospective analysis of the MMX showed no difference between MMX values in patients with and without aspirin resistance. This study was designed to investigate aspirin’s antiplatelet efficacy in the standard dose of 100 mg/d in stroke patients using the platelet function analyzer PFA-100.
Results: CEPI-CT of 214±19s in 14 patients. VWF concentrations negatively correlated with CEPI-CTs and amounted to 160±12%, 194±15% and 262±32% (r=0.31, p<0.001). TXB2 concentrations were non-significantly higher in non-responders (247±15 vs. 206±7 and 207±9). Five patients had to be excluded post hoc because of signs of infection.

Conclusion: Aspirin inhibits platelet function in 50% of stroke patients. Partial platelet inhibition is achieved in 40% and therapeutic failures or aspirin non-responder status were detected in 10%. The PFA-100 could be an appropriate diagnostic tool to optimise secondary stroke prevention in patients on aspirin therapy.

3 Chronic conditions and recurrences

CLOPIDOGREL INDUCED PLATELET INHIBITION CANNOT BE DETECTED BY THE PFA-100 SYSTEM IN STROKE PATIENTS

N. Kotzevlas, K. Elwischger, T. Sycha, W. Rinner, P. Quehenberger, E. Auff, C. Müller
Department of Neurology, Medical University Vienna, Vienna, Austria

Background: The administration of ADP receptor antagonists, like clopidogrel, is recommended in recurrent stroke under aspirin treatment. However, there is an inadequate response to clopidogrel treatment in up to 25% of vascular patients which could be associated with increased re-infarction rates. This study investigated whether the platelet function analyzer (PFA-100) represents an appropriate tool to monitor clopidogrel’s anti-platelet effects in stroke patients.

Methods: Sixteen stroke patients on clopidogrel therapy (75mg/d) were included in a prospective analysis blinded, cross-sectional study. Platelet function was assayed by collagen/epinephrine (CEPI) and collagen/ADP (CADP) induced closure times (CT) using the PFA-100 system. von Willebrand factor antigen (VWF-Ag) levels were measured by enzyme immunoassay.

Results: CEPI- and CADP-CT values averaged 160±15s and 102±10s, respectively, and were in the normal range. VWF-Ag concentrations averaged 153±17% and correlated inversely with CTs (r=0.71; p<0.002 for CEPI-CT and r=0.54; p<0.04 for CADP-CT).

Conclusion: Our data indicate that the current PFA-100 cartridges are not sensitive enough to detect clopidogrel induced platelet inhibition in stroke patients.

4 Chronic conditions and recurrences

ADULT MOYAMOYA ARTERIOPATHY: PERSISTING SYMPTOMS AND PERCOLATION SYMPTOMS DESPITE REVASCUARISATION SURGERY

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Stroke Research, UCL Institute of Neurology, London, United Kingdom

Introduction: Moyamoya arteriopathy is defined as progressive occlusion of large intracranial arteries and formation of basal collateral supply, known as moyamoya vessels. Revascularisation surgery is a treatment used in these patients to prevent major stroke with little evidence for improving blood supply and protection from further symptoms.

Methods: Clinical data of 26 patients (19 female) and MR perfusion results of 10 patients (8 female) were analyzed. All patients were seen by an experienced neurologist and underwent standardized assessment. Two-to-three-month-status (T1min) maps were generated from perfusion MR for visual grading.

Results: Of the 26 patients, 22 were Caucasian, 2 Asian and 2 Afro-Caribbean. The median time between onset of symptoms (15 TIA, 7 ischaemic infarct, 4 haemorrhage) and last follow up was 11 years (1 - 20 years). Median age at onset of symptoms was 8.5 years (1 - 51 years). Patients with haemorrhage presented at an older age. Moyamoya was associated with radiotherapy (n=2), sickle cell disease (n=2) or a congenital disorder (n=6) in some cases. After revascularisation surgery (n=14), 7 patients continued to have TIAs, epileptic seizures or headaches. 7 of 12 patients without revascularisation surgery had similar symptoms. Headache was the most common overall symptom (n=12) and TIA predominantly manifested as positive symptoms (i.e. limb jerking).

MR perfusion colour maps (n=10) showed asymmetry in 6 patients with revascularisation (n=7, bilateral surgery=4) vs 3 without revascularisation.

Conclusion: Persisting symptoms, especially TIAs and headache are common in adults suffering from Moyamoya arteriopathy despite revascularisation surgery. MR perfusion shows evidence of asymmetric perfusion despite revascularisation surgery.

Vascular imaging

1 Vascular imaging

CHARACTERISTICS AND THE FATE OF INTRALUMINAL THROMBUS OF THE INTRACRANIAL AND EXTRACRANIAL CEREBRAL ARTERIES

Yonsei University College of Medicine, Seoul, South Korea

Background: Intraluminal thrombus (IT) may be found incidentally during vascular studies in acute stroke patients. However, characteristics and the fate of IT are unknown.

Methods: Patients who have IT either in the extra or intracranial artery between January 2005 and March 2006 were included in this study. Clinical status and imaging findings were followed up in those patients.

Results: Among 495 acute stroke patients (<7 days after the symptom onset) who admitted during the study period, 11 patients (2.2%, 9 men, age ranged from 61 to 84 years) were identified to have IT. IT was found during digital subtraction angiography (DSA) in seven, and carotid duplex (CD) in four patients. IT was seen as filling defects in three or a stenosis-mimic lesion in four patients on DSA. On CD, IT was seen as mobile one (four patients). While IT could be easily identified when it was seen as a filling defect or mobile, stenosis-mimic lesions were diagnosed as being IT as they disappeared on follow-up studies. IT was found in the clinically relevant artery in nine patients. Complete resolution of IT was confirmed in all patients who had follow-up vascular imaging studies (nine patients), 27.6 days (range 7–89 days) after its detection. During follow-up, three patients developed transient or minor ischemic symptoms. They included recurrent transient ischemic attacks, transient worsening of pre-existing weakness, and retinal artery occlusion, which were potentially related to IT. All occurred shortly after the detection of IT (6, 9, 20 days). Appearance of IT in them was mobile in one or stenosis-mimic in two. Diffusion-weighted MRI was undertaken soon after the disappearance of IT in three patients who did not develop ischemic symptoms and no lesion was found in them.

Discussion: IT showed various features such as mobile form, filling defect, or stenosis-mimic lesion. IT tended to produce neurologic symptoms during the early stage when they occur, but appeared to be dissolved spontaneously thereafter.

2 Vascular imaging

INTRACRANIAL NONOCCLUSIVE THROMBUS ON CT ANGIOGRAPHY: REASON TO BE CONCERNED?

V. Puetz, I. Dziatkowski, S. Subramaniam, A. Krol, M. Goyal, A.M. Demchuk
Calgary Stroke Program, Department of Clinical Neurosciences, University of Calgary, Calgary, Canada

Background: The impact of intracranial nonocclusive thrombus (INOT) in acute ischemic stroke is unknown. We sought to determine the clinical course of patients with INOT diagnosed by CT angiography (CTA).

Methods: 665 patients underwent CTA for acute ischemic stroke (06/02 to 03/06). We retrospectively identified patients with INOT from CTA reports and analysed the clinical data. Criteria to diagnose INOT rather than atherosclerotic stenosis were 1) non-tapering of the thrombus 2) eccentricity of the residual lumen 3) clot location in distal arterial segments 4) absence of wall calcification at the level of the narrowing 5) multiplicity. If atherosclerotic stenosis or occlusive thrombus were relevant artery in nine patients. Complete resolution of IT was confirmed in all patients who had follow-up vascular imaging studies (nine patients), 27.6 days (range 7–89 days) after its detection. During follow-up, three patients developed transient or minor ischemic symptoms. They included recurrent transient ischemic attacks, transient worsening of pre-existing weakness, and retinal artery occlusion, which were potentially related to IT. All occurred shortly after the detection of IT (6, 9, 20 days). Appearance of IT in them was mobile in one or stenosis-mimic in two. Diffusion-weighted MRI was undertaken soon after the disappearance of IT in three patients who did not develop ischemic symptoms and no lesion was found in them.

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Discussion: IT showed various features such as mobile form, filling defect, or stenosis-mimic lesion. IT tended to produce neurologic symptoms during the early stage when they occur, but appeared to be dissolved spontaneously thereafter.
Conclusion: Presence of iNOT represents a group of patients at risk for stroke or recurrence. Although a majority has a good functional outcome the subgroup with persistent or progressing iNOT appears to be at risk.

3 Vascular imaging

ULTRASONOGRAPHIC EVALUATION OF HEMODYNAMIC CHANGES DURING ARM-EXERCISE IN PATIENTS WITH SUBCLAVIAN STEAL
S. Fujimoto, K. Toyoda, M. Yasaki, J. Jimouchi, S. Sadoshima, Y. Okada National Kyushu Medical Center, Nippon Steel Yawata Memorial Hospital, Kitakyushu, Japan

Background & Purpose: The purpose of the present study is to investigate the availability of conventional carotid duplex ultrasonography (CCU) and transcranial color-coded sonography (TCCS) for evaluation of hemodynamic changes during arm-exercise in patients with subclavian steal.

Methods: This study included 15 consecutive patients with left subclavian steal. Thirteen patients were asymptomatic (SSP-group) and 2 shows subclavian steel syndrome (SSS). Using CCU and TCCS, baseline flow velocity and direction of the left vertebral artery (VA) and basilar artery (BA) were measured. The regional cerebral blood flow (rCBF) in the bilateral superior cerebellar artery territory (SCA) was measured quantitatively by single photon emission computed tomography (SPECT). These parameters were measured before and after arm exercise in each patient.

Results: On the baseline CCU, 7 patients shows complete (systolic and diastolic) retrograde flow (Type A), and 8 shows systolic retrograde flow following diastolic antegrade flow (Type B) of the left VA. Both SSS patients belonged to Type A. In SSS patients, mean flow velocity (3.8 ± 1.4 cm/sec vs. 1.9 ± 1.6 cm/sec) and rCBF (4.1 ± 5.0 ml/100g/min vs. 0.3 ± 1.1% ICA) and in the cerebellum relatively more decreased during the arm-exercise in Type A than Type B patients (not significant). In both SSP group and SSS patients, retrograde mean flow velocity of the left VA increased by the arm-exercise. In SSP group patients, BA mean flow velocity (49.1 ± 12.6 to 47.6 ± 14.6 cm/sec, -3.1 ± 8.5%) and cerebellar rCBF (54.6 ± 5.3 to 54.4 ± 5.5 ml/100g/min, -0.3 ± 9.3%) showed no significant change during the arm-exercise. However, BA mean flow velocity (Case 1, 64.7 to 44.3 cm/sec, -31.5% ; Case 2, 45.2 to 31.5 cm/sec, -30.3%) and cerebellar rCBF (Case 1, 62.5 to 48.8 ml/100g/min, -21.9%; Case 2, 45.7 to 35.7 ml/100g/min, -21.9%) reduced remarkably by the arm-exercise in 2 SSS patients.

Discussion: Changes in the BA flow velocity during the arm-exercise were remarkable in SSS patients. CCU and TCCS can evaluate hemodynamic changes in the BA territory in patients with subclavian steal.

4 Vascular imaging

SKULL THICKNESS AND BONE DENSITY IN PATIENTS WITH INADEQUATE ACOUSTICAL TEMPORAL BONE WINDOW IN TRANSCRANIAL DOPPLER ULTRASOUND
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Background: Transcranial Doppler ultrasonography (TCD) may enhance treatment (e.g. thrombolysis) of acute stroke by providing continuous monitoring of middle cerebral artery (MCA) blood flow velocities. The availability of TCD tests is limited by the presence of acoustic windows. We present the association of skull thickness and density to the temporal bone window failure (WF), and to adjust for possible confounding factors.

Multiple logistic regression analysis was used to relate independent variables to WF, and to adjust for possible confounding factors.

Results: TCD signals on the symptomatic side were absent in 22 female and 11 male patients (18%). Both skull thickness and skull density at the level of the temporal bone window were strongly related to window failure as well as to age and female sex. After adjustment for age and sex, skull thickness at the temporal bone window proved to be an independent predictor of window failure (Odds Ratio: 2.3 per 1 cm decrease in thickness). Skull density at the level with age in women (-5.2 IU per 10 years over 50 years of age, 95% C.I.: -73;30), but not in men (<10 IU per 10 years over 50 years of age, 95% C.I.: -33;13).

We calculated probabilities of WF for each patient individually, using a multiple regression model including age, sex, and skull thickness. With a probability cut-off of 50%, 33% of the patients with WF were correctly identified of having WF, and only 97% of those without WF. The area under the ROC curve was 0.88.

Conclusion: WF is more common in women, because skull density in elderly women is low. WF can be predicted using simple parameters as skull thickness, age, and sex. This may facilitate a rapid delivery of ultrasound-enhanced thrombolyis.

5 Vascular imaging

PATIENTS WITH DECREASE OF FLOW VELOCITIES IN THE SYMPTOMATIC MIDDLE CEREBRAL ARTERY – CLINICAL FOLLOW-UP AND ULTRASOUND FINDINGS
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Patients (pat.) with decrease of peak systolic flow velocities (PSV) in the symptomatic middle cerebral artery (sMCA) after stroke or for transitory ischemic attack (TIA) may be at high risk for recurrent ischemic events. Present knowledge is scarce regarding the clinical course and ultrasound findings as measured by transcranial color-coded sonography (TCCS). Between June 05 and June 06 consecutive pat. with stroke or TIA were examined within 12 h after admission by TCCS (HP SONOS 5500). Pat. with PSV decrease > 50% in the M1 (depth 50-55 mm) of the sMCA compared to contralateral were included and followed-up clinically and by TCCS 9-18 months after admission. Examinational findings were documented. Stroke severity was assessed by the National Institute of Health Stroke Scale (NIHSS) and recovery by the modified Rankin Scale (mRS). Fourteen pat. (10 m/4 f, mean age 65.5 y, 21-85) of 447 examined by TCCS were followed-up after a mean time of 404 d (289-553 d). Two pat. presented with a TIA, 9 with major, 3 with moderate strokes in the territory of the sMCA. Mean NIHSS was 14. Three pat. with major strokes died of causes not directly related to stroke. One pat. (21 y) with decrease of PSV in sMCA at follow-up had a recurrent stroke after 111 d. At follow-up 4 pat. showed a persistent decrease of PSV > 50%, all achieved mRS 0-3. In 4 a decrease > 20% was found. A good outcome (mRS 0-2) was seen in a total of 7 patients. Six pat. had an occlusion of ICA on the symptomatic side, 2 showed decrease of PSV > 20% in sMCA at follow-up had a recurrent stroke after 111 d. At follow-up 4 pat. showed a persistent decrease of PSV > 50%, all achieved mRS 0-3. In 4 a decrease > 20% was found. A good outcome (mRS 0-2) was seen in a total of 7 patients. Six pat. had an occlusion of ICA on the symptomatic side, 2 showed decrease of PSV > 20% in sMCA at follow-up had a recurrent stroke after 111 d. At follow-up 4 pat. showed a persistent decrease of PSV > 50%, all achieved mRS 0-3. In 4 a decrease > 20% was found. A good outcome (mRS 0-2) was seen in a total of 7 patients. Six pat. had an occlusion of ICA on the symptomatic side, 2 showed decrease of PSV > 20% in sMCA at follow-up had a recurrent stroke after 111 d. At follow-up 4 pat. showed a persistent decrease of PSV > 50%, all achieved mRS 0-3. In 4 a decrease > 20% was found. A good outcome (mRS 0-2) was seen in a total of 7 patients. Six pat. had an occlusion of ICA on the symptomatic side, 2 showed decrease of PSV > 20% in sMCA at follow-up had a recurrent stroke after 111 d. At follow-up 4 pat. showed a persistent decrease of PSV > 50%, all achieved mRS 0-3.

6 Vascular imaging

ASSESSMENT OF THE CEREBRAL VASOMOTOR REACTIVITY USING A TRANSCRANIAL DOPPLER SONOGRAPHY AND FUNCTIONAL MRI
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Background: Several methods are being used to assess cerebral vasomotor reactivity (CVR), including transcranial Doppler (TCD) sonography. However, no standardized examination protocol exists for this widely used examination. Alternative noninvasive hemodynamic imaging can be performed with blood oxygenation level-dependent functional magnetic resonance imaging (fMRI). The aim was to assess the correlation of TCD and fMRI in the assessment of CVR.

Methods: Study group consisted of 28 patients (24 males, 4 females; age 30-82, mean 63.1±11.0 years), presenting with 29 occluded internal carotid arteries. TCD examination, including breath-holding/hyperventilation test (BH/HV) and breath-holding index (BHI), and fMRI examination were used for the assessment of CVR. fMRI employed a bimanual motor task within both a block paradigm and an event-related paradigm. Cohen’s Kappa was applied when statistically assessing the correlation of the methods.

Results: In fMRI, impairment of cortical hemodynamics manifested consistently as diminished extent of active motor cortex, smaller magnitude and wider shape of the hemodynamic response and longer hemodynamic delay when compared to the normal side. The following correlations were found – between BH/HV and BHI and FMR 56.8%, kappas=0.205; BH/HV and fMRI 65.5%, kappas=0.322; BHI and fMRI 58.6%, kappas=0.151; TCD (consistent result of both BH/HV and BHI test) and fMRI 70.6%, kappas=0.414.

Discussion: In the evaluation of CVR, there is only a minimal correlation between the particular TCD tests (both BH/HV and BHI) and fMRI examination. However, there is a good correlation between TCD and fMRI in the case of congruity of both TCD tests.

Vascular imaging

**RECOGNITION OF BRAIN ISCHAEMIA BY GENERAL RADIOLOGISTS: A REAL PRACTICE STUDY**

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**Background:** There is evidence that general radiologists make few errors when reporting acute computer tomography (CT) brain imaging. However, as most of these scans are normal, such studies may not reflect all types of routine practice. We sought to compare the recognition of brain ischaemia by general radiologists and neuroradiologists among a cohort of patients referred to a neurologist.

**Methods:** Over a three year period patients referred to a single neurologist were selected for dual reporting by general radiologists and neuroradiologists because of a clinical or radiological concern. Disagreements over brain ischaemia were recorded and compared.

**Results:** 417 patients were selected for dual reporting. The primary finding or diagnosis differed in 68 patients (16.3% or almost 1 in 6 of all selected patients). Brain ischaemia discrepancies were responsible for differences in 35 patients (51.5% of all disagreements in the study). Neuroradiologists refuted brain ischaemia in 16 patients (6 men, 10 women, mean age 58.2 years) but newly identified ischaemia/infarction in 19 other patients (11 men, 8 women, mean age 63.4 years, p=not significant). Seven of the 16 patients in whom ischaemia had been refuted had been discharged from CT scans, the remaining had had magnetic resonant imaging (MRI) scans. Similarly 7 of the 19 patients who had ischaemia identified solely by neuroradiologists had had CT brain scans and 11 had MRI scans (p=not significant).

**Discussion:** Routine neuroradiology practice allows assessment of neuroimaging quality assurance in brain ischaemia. Discrepancies between general radiologists and neuroradiologists about brain ischaemia involve CT scans almost as frequently as MRI scans.

**Correlation between characteristics of carotid stenosis (degree of stenosis, microembolic signals and cerebral vasoreactivity) and types of MRI lesions**

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**Background:** Relationship between internal carotid artery (ICA) stenosis and stroke has been widely studied. However little is known about the different types of stroke related to these stenoses and their potential related characteristics: microemboli and impaired cerebral vasoreactivity.

**Methods:** 52 patients were included in a 2-years period. Inclusion criteria were (i) 50-99% stenosis of the ICA based on the peak systolic velocity (PSV >120 cm/s) or poststenotic flow reduction measured with Duplex ultrasonography; (ii) four investigations had to be performed within a month including (a) microembolic signals (MES) detection (b) cerebral vasoreactivity, (c) Transcranial Color-Coded Duplex ultrasonography (TCCD) and (d) MRI. We excluded patients on anticoagulation or diprydamole treatment and with known embolizing cardiopathy, tandem stenosis, dissected or occluded ICA and middle cerebral artery stenosis. MRI scans were categorized by 2 independent blinded investigators between embolic, border zone, lacunar and no lesion for each side of the brain. Positive MES detection was considered if ≥ 1 MES present, and vasoreactivity impaired if breath holding index BHI <0.69. We differentiated the classical NASCET group of stenosis (moderate 50-69% and high grade 70-99% stenosis) and did a subgroup analysis for very high grade stenosis (PSV >210 and EDV >130 cm/s) corresponding to 80-99% stenosis.

**Results:** Among the 69 ICA stenoses eligible for analysis 22 consisted of moderate stenoses (50-69%) and 47 were high grade (70-99%) stenoses among those, 22 grade stenosis (PSV ≥ 210 and EDV ≥ 130 cm/s) corresponding to 80-99% stenosis.

**Discussion:** The differentiation of high and low grade IAS by TCCS offers a guide the physician in his therapeutic options.

**INTRACRANIAL ARTERY STENOSIS (IAS) - DIAGNOSTIC ACCURACY OF TRANSCRANIAL COLOR-CODED SONOGRAPHY (TCCS) AND LONG TERM ULTRASOUND FOLLOW-UP**

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**Background:** In clinical routine intracranial artery stenosis graduation by TCCS is sometimes different from the results of magnetic resonance angiography (MRA) or digital subtraction angiography (DSA). This study compared results from TCCS in IAS with MRA and DSA findings and evaluated long term follow-up results of flow velocities in IAS.

**Methods:** This prospective study was a part of a multicenter trial and included 29 patients with symptomatic IAS (mean age: 56.3 ± 11.6 years, 55.2% female, stenotic arteries: 13 MCA, 1 PCA, 8 BA, 1 VA, 6 intracranial part of ICA). IAS graduation by TCCS was based on the paper of Baumgartner et al. (1999) with criteria for IAS with more or less than 50% diameter reduction (< 50%, n = 9, > 50%, n=20). Evaluation of the reference methods was performed by a senior neuroradiologist (MRA [n = 23], DSA [n = 3]) and both [n = 3]. We investigated the patients every 6 month up to 24 months after inclusion. Progression or regression of IAS was defined for a change of more than 20% of peak systolic blood flow velocity.

**Results:** For the detection of high grade IAS (> 50% diameter reduction) we calculated for TCCS compared to the reference methods a sensitivity, a positive predictive value, a specificity, and a negative predictive value of 0.7, 0.89, 0.6 and 0.3, respectively. Regarding long term evaluation of flow velocity we could analyse data of 10 patients without intracranial angioplasty or stenting (mean age: 55 ± 9.9 years, 56.3% female). In 14 patients (87.5%, n = 9 > 50% diameter reduction) there was a regression of the degree of IAS (mean time interval: 6 months) and in 2 patients (12.5%) we found a progression.

**Conclusion:** The differentiation of high and low grade IAS by TCCS offers a moderate sensitivity and a low specificity compared to the reference methods. This could be a result of technical problems in both the ultrasound method and the reference methods with their well known technical limitations. The long term follow-up investigation revealed a good prognosis with respect to stenosis progression.

**Prognostic predictors**

**1 Prognostic predictors**

**THE IMPACT OF ABNORMAL MOOD ON RETURN TO PAID EMPLOYMENT FOLLOWING IN STROKE SURVIVORS: RESULTS FROM THE AUCKLAND REGIONAL COMMUNITY STROKE (ARCS) STUDY**

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**Background:** An ability to participate in paid employment has vital implications for a person’s psychological well-being, physical health and role in society. As stroke is traditionally considered a disease of the elderly, there is a paucity of generalisable information useful for young stroke survivor except on the impact of abnormal mood on return to work.

**Methods:** ARCS was a prospective, population-based, stroke incidence study in Auckland, New Zealand undertaken during 2002-2003. Data collected at baseline, 28-days and six-months after onset included pre-stroke employment status, mood assessed using the 28-item General Health Questionnaire (GHQ-28) at 28 days, and return to paid employment at six months. Multivariate logistic regression was used to determine predictors including the impact of abnormal mood (GHQ-28 score ≥ 5 using standard 0, 0, 1, 1 scoring) on return to paid employment.

**Results:** Among 1423 first-stroke, 238 patients in paid employment prior to the stroke were alive at 28-days. Of these, 176 (74%) completed the GHQ-28 and of these 94 (53%) had returned to paid employment six-months. Abnormal mood at 28-days was a significant predictor of return to work (OR 2.8, 95% CI 1.4 - 5.3) after controlling for age, sex, comorbidity, level of disability, full time status and education level.

**Conclusion:** Almost half of previously employed people who experience a stroke do not return to paid employment, with the early onset of abnormal mood being a crucial determinant. Many factors identified in more disabled rehabilitation populations such as speech problems, lesion site and type of stroke were not predictors. A greater awareness and appropriate management of abnormal mood following stroke is important to optimising ability to return to work and other aspects of recovery from stroke in younger adults.
Prognostic predictors

2 Prognostic predictors

HIGH PLASMA LEVELS OF LEPTIN AT DISCHARGE PREDICT SUBACUTE POSTSTROKE MAJOR DEPRESSION

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Background: Post-stroke depression is associated with poor outcome. Since high levels of leptin are found in people with depression we analyzed the relationship between leptin plasma levels and post-stroke depression.

Patients and methods: We included 134 patients with a first episode of ischeic stroke, no previous history of depression, NIHSS < 8 at discharge (mean stay, 8.43 days), and without speech disturbances. Stroke severity was evaluated by NIHSS at discharge and 1 month after stroke. Functional outcome was evaluated by modified Rankin Scale (mRS) at 1 month. Major depression was evaluated at discharge and at 1 month by DSM IV criteria and Geriatric Depression Scale of Yesavage.

Results: Twenty five patients (18.7%) showed major depression at discharge. Out of 104 patients who completed the follow-up period, 23 were depressed at 1 month (22.1%). Patients with depression had worse functional outcome (mRS 2 [1, 3] vs 1 [0, 2]; p<0.01) and similar stroke severity at 1 month. Serum leptin levels were associated with depression at discharge (6.4 ng/mL [3.7, 16.8] vs 43.4 [23.4, 60.2] ng/mL; p<0.001) and at 1 month (6.4 [3.3, 12.1] vs 46.1 [33.9, 117.7] ng/mL; p<0.001). Leptin levels were even higher in the 8 patients who developed depression after discharge (114.6 [87.6, 120.2] vs 7.2 [3.6, 13.6] ng/mL; p<0.001). Serum levels of leptin >20.7 ng/mL (sensibility 86%, specificity 84%) were independently associated with post-stroke depression (OR: 16.4 [5.2, 51.5]; p<0.001).

Conclusions: Leptin levels in blood at hospital discharge are associated with post-stroke depression and may predict its development during the next month.

3 Prognostic predictors

PREDICTORS OF ADHERENCE TO TREATMENT IN SECONDARY STROKE PREVENTION

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Background: This study was conducted to determine to what extent demographic, social psychological, physiological, adherence, and family practitioner follow-up characteristics predict achievement of blood pressure and/or glycated hemoglobin targets in patients with TIA or stroke attending a stroke prevention clinic (SPC).

Methods: Using a prospective cohort design, 313 patients were recruited from referrals to a SPC. Thirty one percent had previously been treated with rtPA for acute ischemic stroke.

Results: Of the 313 baseline participants, 77 had confirmed TIA or stroke plus hyperlipidemia. Of the 313 baseline participants, 77 had confirmed TIA or stroke plus hyperlipidemia. Of the 313 baseline participants, 77 had confirmed TIA or stroke plus hyperlipidemia. Of the 313 baseline participants, 77 had confirmed TIA or stroke plus hyperlipidemia.

Conclusion: Ninety-six percent had hypertension and 27% were diabetic. Twenty-three patients (24%) were treated with rtPA for acute ischemic stroke.

4 Prognostic predictors

CAROTID ARTERY STENTING - RISKFACTORS OF EARLY RECURRENT STENOSIS

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Background: Carotid artery stenting (CAS) has emerged as an acceptable treatment alternative in patients with carotid artery stenosis. Long-term outcome remains uncertain.

Methods: Prospective collected parameter including baseline riskfactors, medical treatment, inflammatory parameter and initial technical results of 184 CAS procedures in 178 patients with carotid stenosis of 70% or greater were analyzed after 6 months. Ultrasound results were classified into five groups based on morphological and haemodynamical parameters. Severe restenosis was defined as at least 70%. Parameters showing a trend (p<0.10) in univariate analysis were included into a multivariate analysis.

Results: In univariate analyses six parameters showed at least a trend as a risk factor for recurrent stenosis: hypertension, smoking, no treatment with ACE-Inhibitors or AT-Blocker, increased blood glucose and the initial technical result. The multivariate analysis found only the initial stenting result of a minor remaining stenosis as a risk factor (p<0.03). The initial stenting result for a stented carotid artery and a blood glucose level greater than 120mg/dl at time of intervention missed the significance level with p-values of 0.09 and 0.05.

Discussion: In our cohort especially the initial technical result after stenting had a predictive value for development of a high-grade recurrent stenosis 6 months after carotid stenting.
As many as 44% of patients presenting with ICH could benefit from treatment. The strongest predictors of patient outcome at admission are neurological status and CT. There is increasing evidence that protein levels may correlate with poor SAH outcome. The aim of this study was to assess whether Heart-Fatty Acid Binding Protein (H-FABP) and S100B plasma values were associated with poor outcome after SAH.

Results: H-FABP and S100B correlated with both WFNFS at admission (r=0.365 and 0.623 respectively, p<0.01) and GOS at 6 months (r=0.334 and 0.375 respectively, p<0.01). The best cut-off levels to distinguish patients with poor outcome (GOS 1 to 3) from patients with good outcome (GOS 4 and 5) were: S100B = 0.4 μg/L (p<0.0001) with a specificity (SP) of 89% [95%IC, 81-95%], a sensitivity (SE) of 45% [95%IC, 31-59%] and positive (PPV) and negative (NPV) predictive values of 73% and 72%; and H-FABP = 3.04 μg/L (p<0.0001) with a SP of 75% [95%IC, 64-84%], a SE of 51% [95%IC, 36-65%], a PPV of 70% and a NPV of 54%. The combination of H-FABP and S100B by considering a negative test to be below both optimal cut-off values showed an improvement of the sensitivity (73%) and negative predictive value (61%). In contrast, a combined positive test considered above the cut-off values improved specificity (97%) and positive predictive value (86%).

Discussion: The combined elevation of plasmatic H-FABP and S100B is a good predictor of poor long term SAH outcome. Its use in conjunction with clinical status and CT at admission may focus attention on patients at risk of poor outcome after SAH.

Background: Subarachnoid aneurysmal hemorrhage (SAH) is a devastating and lethal event. The potential future availability of a currently under-investigation haemostatic agent, recombinant factor VII activated (rFVIIa), could require improvement of care organization. The aim of this study was to evaluate obstacles to rFVIIa use.

Methods: A series of 352 consecutive patients admitted within 2 days after SAH onset and showing evidence of bleeding on CT was included. The Fisher and World Federation of Neurological Surgeons (WFNS) scores at admission and the Glasgow Outcome Score (GOS) at 6 months were evaluated. Blood concentrations of H-FABP and S100B were determined at admission by ELISA. Pearson or Spearman tests were used to study the correlation between quantitative variables. Receiver operating characteristic (ROC) curves were built to calculate the sensitivity and specificity for biomarker cut-off values to predict a poor SAH outcome.

Results: H-FABP and S100B correlated with both WFNS at admission (r=0.365 and 0.623 respectively, p<0.01) and GOS at 6 months (r=0.334 and 0.375 respectively, p<0.01). Among them, 28 had a pre-stroke modified Rankin scale > 2, 27 had a coagulopathy or were under anticoagulant therapy, and 3 had a recent history of thrombotic disease. Of the 145 remainders, only 64 patients (44%) were admitted within 2h45 of onset, and 40 of them had cerebral imaging within 3 hours, i.e 15.9% of all ICH patients.

Discussion and conclusion: Our study revealed that, although near half ICH patients had no clinical contra-indications for rFVIIa, only 15.9% could have received the treatment in practice. The major limitation was the delay.
has been evaluated in several studies mostly with negative results, but all studies classified acute hydrocephalus dichotomously as “present” or “absent” and did not take into account the degree of the hydrocephalus. We studied whether the degree of acute hydrocephalus has predictive value in SAH patients with regard to the occurrence of DCl.

Methods: From our prospectively collected database of SAH patients, we retrieved all patients admitted between February 2002 and February 2006 when a CT scan was performed within 4 days after the haemorrhage. Ventricular enlargement was quantified by measuring the (relative) bicaudate index and the third ventricle width. Data were analysed continuously and after categorisation into quartiles. The relationship between the variables and the development of DCl and death were analysed by means of the Cox Proportional Hazard model.

Results: A total of 321 patients were included. Hazard ratios (HR) of the continuous variables showed no significant relationship in univariable analysis (HR bicaudate index 1.01; 95% CI 0.97-1.06, HR relative bicaudate index 1.00; 95% CI 1.00-1.01, HR third ventricle 0.99; 95% CI 0.92-1.06. There were no statistically significant differences between the adjusted HR’s for the higher quartiles of the bicaudate index (HR’s between 0.9 and 1.3) versus the lowest quartile. No linear trend was recognised in consecutive quartiles. Analysis of the relative bicaudate index yielded similar results.

Discussion: Acute hydrocephalus has no predictive value for the occurrence of DCl, irrespective of the degree of the hydrocephalus.

7 Cerebral haemorrhage and SAH
ROLE OF INTRAVENOUS CITICOLINE FOR SUPRATENTORIAL HEMORRHAGE
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Background: The study was conceived to investigate the role of citicoline in supratentorial intracerebral hemorrhage (ICH).

Setting: This study was conducted in Cebu City, Philippines involving 6 referral sites.

Objectives: To determine the efficacy & safety of 4 gms IV citicoline in the treatment of acute supratentorial ICH over the next 14 days,1 month & 3 months.

The primary efficacy analysis was the proportion of favorable responders with BI score while secondary efficacy analysis included MRS, NIHSS & all cause mortality rates. Analysis of safety included all serious & non-serious adverse events.

Methods: This was a randomized, double-blind, placebo-controlled, multicenter parallel group study on patients with first ever supratentorial ICH given either 4 gms citicoline or placebo for 14 days from index stroke. The computed sample size was 436 patients.

Results: A total of 182 patients were enrolled. The mean age were similar, 56.9±11.45 for citicoline & 57.61±11.83 for placebo. Comorbidities were similar except for the higher number of diabetics in citicoline gp. More patients had favorable BI score (2.2 vs 0, 9.2 vs 8.5, & 50.8 vs 31.9) in citicoline gp than in placebo respectively with the difference clinically significant only after day 90.

Of the Cerebrovascular Reserve Assessment in Patients with Carotid Artery Disease Using Bold fMRI
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Introduction: Cerebrovascular reserve (CVR) refers to the spare capacity of the cerebral circulation to increase blood flow if necessary. Together with quantitative analysis of the local microvascular haemodynamics in motor tasks, hypercapnia (fMRI) allows full assessment of the CVR of patients with carotid artery disease. The aim of this study was to assess the CVR capacity in symptomatic and asymptomatic patients with carotid artery disease and to investigate the interrelationship between cerebral autoregulation and motor task induced signal change and the CVR in these patients.

Methods: Nineteen patients with symptomatic (n=13) and asymptomatic (n=6) moderate to high grade internal carotid artery stenosis or occlusion were scanned using a clinical 1.5T Intera (Philips, Netherlands) MR scanner. All 19 patients
underwent CO2 reactivity testing with 10 patients also being investigated with fMRI motor task in the same session. We analysed the data using FSL software.

**Results:** 19 patients (15 males and 4 females) with a mean age of 67.4 years underwent successful fMRI scanning. In the symptomatic patients there was a significant difference between the symptomatic hemisphere mean PSC/mmHg change [0.09% (SD 0.1)] versus the asymptomatic hemisphere [0.17% (SD 0.1)] (Wilcoxon, p=0.007). In the asymptomatic patient group there was no difference between the PSC/mmHg in the right and left hemispheres. We also found a significant correlation between the BOLD responses to the motor task and CVR (Spearman’s r 0.809, p<0.0005).

**Conclusions:** In those patients with symptomatic carotid artery disease, the symptomatic hemisphere has a significantly reduced CVR as compared to the asymptomatic hemisphere. The results also show that neurovascular coupling is linearly and strongly correlated with CVR.

### Genetic disorders

#### 1 Genetic disorders

**A TIMP-2 GENE PROMOTOR POLYMORPHISM AS DETERMINANT OF ISCHEMIC (IS) AND HEMORRHAGIC STROKE (HS)**

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**Background:** Both IS and HS are associated with expression and activation of matrix metalloproteinases (MMPs). Particularly relevant are MMP-2 and MMP-9. This proteolytic effect is dampened by tissue inhibitors of metalloproteinases (TIMPs). TIMP-2 is an essential co-activator but also an important inhibitor of MMP-2, depending on local concentration. Genetic disposition in the TIMP-2 promoter may contribute to severity and prognosis of stroke.

**Methods:** TIMP-2 promoter SNP -261A>G was genotyped from sequentially recruited patients (n=356, f/m 151/205, mean age 68.17 yrs, range 19-100 yrs) and gender and age matched controls (n=253, f/m 114/139, mean age 68.45 yrs, range 32-92 yrs) after gene sequencing of a subgroup of 48 patients and 47 controls. Additionally serum levels of TIMP-2 were measured in a random sample of 93 patients at day 1, 2, 3 and 7 after stroke onset and compared to haplotype.

**Results:** Promoter SNP -261G>A in the TIMP-2 gene shows an allele frequency of approximately 39.1%. AA homozygosity is associated significantly with development of stroke (p<0.05, OR 1.598, CI 1.001-2.553) as compared to AG and GG (recessive mode). Concordantly serum levels of TIMP-2 showed a non-significant decrease depending on the haplotype (AA 94.07 ± 48.86ng/ml vs. GG 110.82 ± 40.33ng/ml).

**Conclusion:** We investigated a SNP in the promoter region of TIMP-2, an enzyme which is known for being involved in the pathophysiology of IS and HS. Our study supports a role for the Cx37 gene as a risk factor for ischaemic stroke, which will need to be replicated in other populations. TGA and CAG haplotypes may confer a minor amount of increased risk or protection with a significant trend in our Scottish male population.

#### 2 Genetic disorders

**CEREBRAL AUTOSOMAL DOMINANT ARTERIOPATHY WITH SUBCORTICAL INFARCTS AND LEUKOENCEPHALOPATHY (CADASIL): A REVIEW OF THE CLINICAL PHENOTYPE IN SCOTLAND**

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**Background:** CADASIL is an autosomal dominant disorder due to mutations on the Notch3 gene. We reviewed the clinical features of patients with CADASIL seen at a Neurovascular Genetics Service in the United Kingdom.

**Methods:** Retrospective review of a CADASIL database. Demographic details, age and mode of onset of symptoms, age at onset of stroke, migraine, seizures, psychological disturbance and cognitive impairment were recorded. History of smoking and significant alcohol intake was recorded. Individual mutation and pedigree was recorded.

**Results:** Records of 62 patients with CADASIL were reviewed (21 pedigrees, 14 mutations, exon 4 – 55 individuals, exon 5 - 2, exon 6 - 2, exon 2 - 3x34 male, 47 alive). Most frequent mutations were R141C (22), R169C (12) and R133C (9). Most common mode of onset was migraine (33/62). 9/62 had an initial alternative diagnosis of multiple sclerosis. 34/62 had current or prior migrainous episodes and this was the mode of onset in 33 (average age at onset 29.7 ± 12.7 years).

#### 3 Genetic disorders

**CONNEXIN 37 AS A CANDIDATE GENE FOR STROKE**

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Identifying candidate genes involved in the pathogenesis of stroke is costly and time consuming. Using pooled DNA, from heterozygous unaffected population to screen for polymorphisms may be a rapid and cost effective method for designing further association studies. Connexin 37 (Cx37) gene is involved in atherosclerosis, and a polymorphism in this gene has been associated with coronary artery disease. The aim of this study was to screen pooled DNA from well phenotyped stroke patients and a matched control population for polymorphisms in potential candidate genes, and then individually genotype any potential associations.

Initial screening of different polymorphisms in a series of genes including 3 exonic SNPs of Cx37 (C1019T, G147A & G132A) was done on validated pooled DNA samples from classified stroke cases and controls using pyrosequencing. Based on finding a positive association of Cx37 polymorphism and ischaemic stroke in the DNA pools, 628 cases and 716 controls were genotyped using Dynamic Allele Hybridisation and Pyrosequencing. Haplotype frequencies were estimated using PHASE program.

Overall haplotype arrangement in cases and controls was different (p=0.03). CAG & TGA were common in controls (p=0.03) & cases (p=0.04) respectively (Table 1). Amongst the 3 SNPs, allele A at position 132 had the highest impact in ischaemic males (p=0.0005, OR=1.61, 1.25-2.11, 95% CI). This allele was also significantly higher in Large Vessel Disease group (p=0.03, OR=1.37, 1.03-1.82, 95% CI).

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<tr>
<th>Haplotype/Diplotype</th>
<th>% (Male Cases)</th>
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<tbody>
<tr>
<td>CAG</td>
<td>35.91%</td>
<td>43.79%</td>
<td>p=0.002, OR=0.72 (0.58-0.88)</td>
</tr>
<tr>
<td>TGA</td>
<td>22.85%</td>
<td>15.81%</td>
<td>p=0.0005, OR=1.58 (1.22-2.04)</td>
</tr>
<tr>
<td>TGA/CAG</td>
<td>9.50%</td>
<td>17.28%</td>
<td>p=0.004, OR=0.50 (0.31-0.80)</td>
</tr>
</tbody>
</table>

Our study supports a role for the Cx37 gene as a risk factor for ischaemic stroke, which will need to be replicated in other populations. TGA and CAG haplotypes may confer a minor amount of increased risk or protection with a significant trend in our Scottish male population.

#### 4 Genetic disorders

**HERITABILITY OF ISCHAEMIC STROKE IS GREATER IN WOMEN THAN IN MEN: A SYSTEMATIC REVIEW**

E. Touzé, P. Rothwell
Stroke Prevention Research Unit, Oxford, United Kingdom

**Background:** Using data from the Oxford Vascular Study (OxVASC), we recently reported that women were more likely than men to have a family history of stroke in mother than in father. To test the generalisability of this finding, we did a systematic review of available published and unpublished data.

**Methods:** Studies were included if they reported the frequency of family history (FH) of stroke in relation to sex of parent or proband. Where necessary, we contacted authors of studies reporting any data on FHs. Data from OxVASC and three other Oxford cohorts (1925 patients) were secondarily pooled with those from other studies.

**Results:** We obtained data from 18 studies (7941 patients), including unpublished data from 7 studies. Female probands were slightly more likely to have a parental history of stroke than male probands in Oxford studies and other studies (OR=1.2;
interact with each other in a particular biochemical pathway. Most genes identified. Two had been found by other studies (ALOX5AP and PDE4D), and several

Results:

and dynamic allele-specific hybridisation (DASH). Each pool was screened in pools were made from 855 individuals with no history of stroke. Each pool was

Method:

association studies require the screening of thousands of genetic markers. DNA

stroke, and the attributable risk of a specific gene may be small. Genome-wide

Background:

Stroke is the third commonest cause of death in the Western world

H.E. Ross-Adams, A. Pasdar, M.J. Macleod

USING DNA POOLS AND SNP MICROARRAYS

THE IDENTIFICATION OF NOVEL SCOTTISH STROKE CANDIDATE GENES

THE SPECTRUM OF NOTCH3 MUTATIONS IN PORTUGUESE PATIENTS WITH CASDASIL: IMPLICATIONS FOR DIAGNOSTIC STRATEGIES

M. Viana-Baptista, S. Ferreira, P. Costa, M. Venancio, S. Fernandes, F. Carvalho, J.P. Oliveira, J.M. Ferro, Investigators Postyroke

Hospital Garcia de Orta, Almada, Portugal

Background:

Cerebral autosomal dominant arteriopathy with subcortical infarcts and leukoencephalopathy (CADASIL) is caused by mutations of the Notch3 gene on 19p13. A cluster of mutations in exons 3 and 4 was originally reported and limited scanning of these exons was suggested for diagnosis.

Objective: To study Notch3 mutation analysis in Portuguese CADASIL patients.

Methods: Patients with clinical phenotype suggestive of CADASIL (recurrent stroke before 55 years, pre-senile dementia, leukoencephalopathy and family history suggestive of autosomal dominant transmission) or at least one of its clinical features (n=155) and healthy subjects (n=102) were studied. Genomic DNA was extracted from leukocytes and PCR amplified according to standard methods. A two-step diagnostic approach was implemented. Exons 3, 4, 5/6, 11, 18/19, 22/23 were initially sequenced; exons 2, 8, 14 20 were further sequenced in patients with clinical phenotype of CADASIL (after the first 100 cases, exons 4, 11, 18/19, followed by 2, 3, 5/6, 8, 14, 20, 22/23 respectively).

Results: We found 13 pathologic mutations in 40 patients (including 10 relatives of index cases): 9 previously reported mutations [R133C*, R141C, R153C*, R169C, R207C* (exon 4), G4240C (exon 8), R558C*, R757C, R607C (exon 11)], and 4 new mutations [C568Y (exon 11), S978R (exon 18), W1028C (exon 19) and C1099Y (exon 20)]. Screening exons 4, 11, 18/19 detected 85% of Portuguese mutations.

Conclusions: Our results suggest that the spectrum of Notch3 mutations in Portugal may be different from that described in other countries. Limited scanning of exons 3 and 4 may not be appropriate in CADASIL cases of Portuguese origin. The low rate of mutations found may be due to loose criteria for patient inclusion.

6 Genetic disorders

THE IDENTIFICATION OF NOVEL SCOTTISH STROKE CANDIDATE GENES USING DNA POOLS AND SNP MICROARRAYS

H.E. Ross-Adams, A. Pasdar, M.J. Macleod

University of Aberdeen, Aberdeen, United Kingdom

Background: Stroke is the third commonest cause of death in the Western world and a major cause of disability. Twin and family studies suggest a genetic compo-

netent to the disease, but to date few genes have been conclusively associated with stroke, and the attributable risk of a specific gene may be small. Genome-wide

association studies require the screening of thousands of genetic markers. DNA

poools are a confirmed, validated means of testing many samples simultaneously, thus saving time, money and resources. We used this approach to screen patients and controls for stroke candidate genes.

Method: Equimolar amounts of DNA from 372 stroke patients with confirmed LVD or 3Vd were grouped to form 3 DNA pools (1 LVD and 2 3Vd). Three control pools were made from 855 individuals with no history of stroke. Each pool was validated with 5 single nucleotide polymorphisms (SNPs) using Pyrosequencing and dynamic allele-specific hybridisation (DASH). Each pool was screened in triplicate at over 500 000 SNPs using Affymetrix 500K SNP chips. SNP allele frequencies were investigated for significant differences between case and control pools to identify chromosomal regions likely to contain relevant genes.

Results: Over 40 potential candidate genes for ischaemic stroke have been identified. Two had been found by other studies (ALOX5AP and PDE4D), and several interact with each other in a particular biochemical pathway. Most genes identified can be grouped into four main disease processes – lipid metabolism, arteriosclerosis, inflammation and apoptosis; known risk factors for or associated with ischaemic stroke. Individual genotyping on a cohort of ~1000 stroke samples and controls is currently underway to confirm these associations.

7 Genetic disorders

MILD CLINICAL PICTURE IN 5 OLD CADASIL (CEREBRAL AUTOSOMAL DOMINANT ARTERIOPATHY WITH SUBCORTICAL INFARCTS AND LEUKOENCEPHALOPATHY) PATIENTS


Dept. of Neurol. and Psych. Sciences, Florence; Dept. of Neurol. and Behav. Sciences, Siena, Italy

Background: CADASIL is an inherited small vessel disease. Early strokes and cognitive decline (fifth/sixth decades) together with diffuse leukoencephalopathy and multiple lacunar infarcts characterize the clinical and neuroimaging pictures respectively. The phenotype is however highly variable.

Methods: We report on 5 patients (4 females) with typical Notch3 mutations (on exon 11 in two and on exon 10, 21, and 22 in the other 3 respectively) who sought neurological evaluation at advanced age (range 67-79 yrs) for mild or unspecified disturbances.

Discussion: CADASIL clinical picture is variable and minimally symptomatic older patients may be encountered. This kind of patients presents often with vascular risk factors and may be difficult to diagnose considering that age and hypertension are the most important risk factors for sporadic leukoencephalopathy. The severity of leukoencephalopathy and its extension to the temporal poles could be a distinctive feature among the 2 conditions.

8 Genetic disorders

MRNA EXPRESSION LEVEL OF PAI-1 GENE INFLUENCES REVASCULARIZATION RATES OF THE MIDDLE CEREBRAL ARTERY AMONG ISCHEMIC STROKE PATIENTS TREATED WITH T-PA


Neurovascular Research Lab and Neurovascular Unit, Institut de Recerca, Hospital Vall d’Hebron, Barcelona, Spain

Background: Thrombolysis success in ischemic stroke is influenced by protein level of fibrinolysis inhibitors and inflammation enhancers. High pre-treatment concentration of plasminogen activator inhibitor 1 (PAI-1) and MMP-9 mRNA was analyzed by Real-Time PCR assays and PAI-1 4G/5G polymorphism was studied by direct sequencing. MCAO recanalization was diagnosed by Transcranial Doppler at 1 hour and 2 hours after t-PA administration and Computed Tomography was used to determine the appearance of hemorrhagic transformations (HT), respectively. The biological pathways that generate high levels of these molecules are unknown. In order to better explore these pathways we conducted the first study that analyses gene expression patterns of those molecules.

Methods: DNA and RNA were extracted from blood of 54 stroke patients with a middle cerebral artery occlusion (MCAO) before t-PA infusion. PAI-1 and MMP-9 mRNA was analyzed by Real-Time PCR assays and PAI-1 4G/5G polymorphism was studied by direct sequencing. MCAO recanalization was diagnosed by Transcranial Doppler at 1 hour and 2 hours after t-PA administration and Computed Tomography was used to determine the appearance of hemorrhagic transformations (HT), respectively.

Results: High level of PAI-1 mRNA was associated with decreased recanalization rates (recanalization:195%, no recanalization:298%, p=0.227, at 1hour; recanal-

ization:144%, no recanalization:334%, p=0.008, at 2hours). In patients with a proximal MCAO, associations were even stronger (88% vs 261%, p=0.05, at 1hour; recanal-

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to the presence of 4G/5G polymorphism. The appearance of HT is not due to an increased expression of MMP-9 gene. Targeting PAI-1 expression might improve t-PA response.

9 Genetic disorders

HERITABILITY OF “ISOLATED LACUNE” SMALL VESSEL STROKE
E. Touzé, P. Rothwell
Stroke Prevention Research Unit, Oxford, United Kingdom

Background: Ischemic stroke is a heritable condition but it cannot be assumed that heritability is necessarily similar in all subtypes. We studied the relationships between stroke subtypes, risk factors, and family history (FHx) of stroke.

Methods: We collected FHx of stroke, myocardial infarction (MI), and risk factors in ischaemic stroke/TIA patients from the Oxford Vascular Study. Stroke etiology was classified according to the TOAST criteria, with small vessel disease (SVD) also subdivided into “isolated lacune” and “diffuse” subtypes.

Results: 191 (24%) of 806 patients had a positive FHx of stroke in any parent. Prevalence of FHx was higher (p=0.033) in SVD (33%) than in other subtypes (16% to 25%). FHx also tended to be more prevalent in patients with “isolated lacune” (n=67) than “diffuse” (n=55) SVD (39% vs. 25%, p=0.12). Patients with “SVD” and positive FHx were more often female (OR=2.4; 1.1-5.5), more likely to have diabetes (OR=3.8; 1.1-7.2), a FHx of MI (OR=1.9; 0.8-4.4), and a FHx of diabetes or hypertension (OR=2.0; 0.8-4.8). After adjustment for potential confounders, using undetermined subtype as reference, FHx of stroke in any parent was only significantly associated with “isolated lacune” subtype (OR=1.9; 1.1-3.4).

In patients with “isolated lacune” SVD, FHx was associated with diabetes in the proband (OR=2.6; 0.8-8.9) and with diabetes or hypertension in the parent (OR=2.2; 0.8-6.2).

Conclusion: “Isolated lacune” SVD is the stroke subtype with the greatest heritability, but this appears to be at least partly explained by heritability of risk factors, particularly diabetes.

10 Genetic disorders

SPECTRUM OF CEREBROVASCULAR DISEASE RELATED TO MUTATIONS OF COL4A1 IN THE HEREDITARY ANGIOPATHY WITH NEPHROPATHY, ANEURYSMS AND CRAMPS (HANAC) SYNDROME
P. Favole, E. Plaisier, B. Marro, C. Antignac, P. Ronco, S. Alamowitch
Tenon Hospital, APHP, Paris, France

Background: Mutations of COLA1 gene, a major component of the vascular basement membranes, have been previously reported in six porencephaly families with hemorrhagic stroke and sometimes a retinal and small cerebral vessel disease (SCVD). We have recently reported the autosomal dominant HANAC (Hereditary Angiopathy with Nephropathy, Aneurysms and Cramps) syndrome in three families with closely localized mutations in COLA1A1. The systemic phenotype included a renal (hematuria, cysts), muscular (cramps and/or increase of CPK) and retinal abnormality has been hypothesized. We report two families (HM-1 and HM-2) as causative genes for FHM. The pathogenesis of FHM is still unclear, although voltage gated sodium channel (SCN1A) located in 2q24 region has been identified as causative genes for FHM. The pathogenesis of FHM is still unclear, although voltage gated sodium channel (SCN1A) located in 2q24 region has been identified. We report two families (HM-1 and HM-2) as causative genes for FHM. The pathogenesis of FHM is still unclear, although voltage gated sodium channel (SCN1A) located in 2q24 region has been identified. We report two families (HM-1 and HM-2) as causative genes for FHM. The pathogenesis of FHM is still unclear, although voltage gated sodium channel (SCN1A) located in 2q24 region has been identified. We report two families (HM-1 and HM-2) as causative genes for FHM. The pathogenesis of FHM is still unclear, although voltage gated sodium channel (SCN1A) located in 2q24 region has been identified. We report two families (HM-1 and HM-2) as causative genes for FHM. The pathogenesis of FHM is still unclear, although voltage gated sodium channel (SCN1A) located in 2q24 region has been identified. We report two families (HM-1 and HM-2) as causative genes for FHM. The pathogenesis of FHM is still unclear, although voltage gated sodium channel (SCN1A) located in 2q24 region has been identified. We report two families (HM-1 and HM-2) as causative genes for FHM. The pathogenesis of FHM is still unclear, although voltage gated sodium channel (SCN1A) located in 2q24 region has been identified. We report two families (HM-1 and HM-2) as causative genes for FHM. The pathogenesis of FHM is still unclear, although voltage gated sodium channel (SCN1A) located in 2q24 region has been identified.
gene. Except for an overall milder phenotype and a variable age of onset, the patients of HM-1 and -2 families are similar to the FHM2 families reported in the literature showing a stereotypical pattern of migraine associated to hemisensory and hemiparetic attacks with an overall benign course. However, the limited size of the family HM2 and the availability of few members for a direct clinical evaluation prevent us from definitely determine the familial or sporadic occurrence of the disease in this family. The mutations detected in our patients are located in the extreme amino-terminus of the ATP1A2 protein, known to be part of the A domain and representing an uncommon target for mutations. Changes in the length and composition of the N-terminus tail were demonstrated to affect cation specificity and pump conformational equilibrium. Few mutations have been described so far in the amino terminal portion of the protein and it could be hypothesized that a destabilizing effect of the two mutations found may explain the mild phenotype and the late age of onset observed such as the susceptibility to common forms of migraine. However, to demonstrate this hypothesis more mutations have to be identified in the N-terminus of ATP1A2.

14 Genetic disorders

THE ROLE OF MITOCHONDRIAL PATHWAY OF APOPTOSIS GENES AND GENES OF DEATH RECEPTORS POLYMORPHISMS IN PATHOGENESIS OF CAROTID ATHEROTHROMBOTIC ISCHEMIC STROKE

I.M. Shetova, S.A. Limborska, P.A. Slominskiy, K.V. Koltsova, T.V. Tuptsina, V.I. Skvortsova

Russian State Medical University, Moscow, Russian Federation

Background: Genes, participated in programmed cell death (PCD) are known to influence on ischemic brain injury. Our goal was to study the connection between poly(ADP)-ribose polymerase-1(PARP-1), p53, Fas and Fas-Associated Death Domain(FADD) genes polymorphisms and the brain infarction volume(IV) in patients with atherothrombotic ischemic stroke(IS).

Methods: Diallelic Rsal-1 PARP-1, Bsm HI P35, rs3740720 FADD and 1677 G/A Fas polymorphisms was studied in 100 patients (mF=33,67; 68.4±2.7 y) with carotid IS (27 patients with extracranial ICA occlusion, 33 patients with intracranial ICA occlusion and 40 patients with MCA occlusion). MRI-morphometry allowed us to mark out large-size (>90 cm³), medium (40-90 cm³) and small-size (<40 cm³) IV. Unified character of therapy allowed us to neglect the influence of medicines on the IV.

Results: The distribution of genotypes was corresponding to those in total Moscow population. A close association between apoptosis genes polymorphisms and IV was found. Large infarctions prevalied in patients with A/A PARP-1 genotype vs. G/A and G/G genotypes(P=0.0005). C/C BamHI P35 genotype was associated with small-size infarctions (P=0.008). G/G FADD genotype prevailed in patients with big-size infarctions as compared with carriers of A allele(P=0.04), while G/G Fas genotype was associated with small-size IV (P=0.05). These results were independent of vessel occlusion level. Analysis of PARP-1, p53, Fas and FADD polymorphisms combinations revealed predominance of large IV in patients with the most negative genotype combinations(P<0.05).

Discussion: The results allowed us to create test-systems determinant individual sensitivity of brain tissue to ischemia for timely preventive therapy in patients with high risk of extensive damage formation.

15 Genetic disorders

CEREBROVASCULAR MANIFESTATIONS OF FABRY DISEASE: A STUDY OF 12 PATIENTS

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Hospital de S. João, University of Porto, Porto, Portugal

Background: Fabry disease (FD) is a rare metabolic lysosomal disorder in which a deficiency of alpha galactosidase A enzyme activity leads to accumulation of glycosphingolipids, mainly in vascular endothelial and smooth-muscle cells. Fabry disease (FD) is a rare metabolic lysosomal disorder in which a deficiency of alpha galactosidase A enzyme activity leads to accumulation of glycosphingolipids, mainly in vascular endothelial and smooth-muscle cells.豹纹状脑血管病变

Results: Median ages at evaluation were 23y (range: 21-48) for males and 44y (range: 26-54) for females. Six pts had acroparesisethesias, 2 hypothyroid and 8 abdominal complaints. Angiokeratomas were present in 7, cornea verticillata in 9, cardiac involvement in 3 and renal manifestations in 7. Eight pts had non-specific headaches and 5 pts had psychiatric disorders. None of the pts reported previous stroke, although 1 female had a mild right upper limb paresis. Eight pts (3 females) were on ERT. Brain MRI showed ischaemic lesions, mostly in white matter, in the only male and in 2 of the 3 females aged >45y. Two males (mean age: 35.5y) and 4 females (mean age: 47y) had tortuous and/or dilated intracranial arteries.

Discussion: These data are consistent with the known natural history and manifestations of CVD in FD pts. MRI is a sensitive method to screen for the typical ischaemic brain lesions and structural arterial changes associated with FD, including in pts without overt stroke. Artrial changes were present since the 3rd decade of life. Despite X-linked inheritance, the prevalence of cerebrovascular lesions in heterozygous females aged >35y is high.

Meta-analysis and review papers

SIMULATANEOUS BILATERAL TRAINING FOR IMPROVING ARM FUNCTION AFTER STROKE

F.M. Coupar, F. Van Wijck, A. Pollock, J. Morris, P. Langhorne

Academic Section of Geriatric Medicine, United Kingdom

Background: Upper limb hemiparesis is a common impairment following stroke and is often a focus for stroke rehabilitation. Simultaneous bilateral arm training (bilateral training) is a specific rehabilitation intervention for improving upper limb function. We wished to determine the effects of this intervention.

Methods: We carried out a Cochrane systematic review which aimed to identify all randomized controlled trials comparing stroke patients who received bilateral training with those who received placebo, no intervention, usual care or other upper limb interventions. We searched the Cochrane Stroke Group Trials Register, Cochrane Central Register of Controlled Trials, MEDLINE, EMBASE, CINAHL, AMED, Science Citation Index and various occupational therapy and physiotherapy databases. The primary outcomes of interest were performance in activities of daily living and functional movement.

Results: To date, three trials (147 participants) meet the inclusion criteria. The methodological quality of these trials is generally poor, with only one trial reporting concealment of treatment allocation and blinding of the outcome assessor. Only one trial (97 participants) reported performance in activities of daily living and only two (111 participants) reported functional movement outcomes. No statistically significant differences were found between bilateral and unilateral training for improving performance in activities of daily living or upper limb functional movement.

Meta-analysis and review papers

CRITICAL REVIEW AND META-ANALYSIS OF STUDIES OF THE EARLY RISK OF STROKE AFTER TRANSIENT ISCHAEMIC ATTACK

M.F. Giles, P.M. Rothwell

Stroke Prevention Unit, Oxford University Department of Clinical Neurology, Radcliffe Infirmary, Oxford, United Kingdom

Background: Recent research has highlighted the substantial risk of stroke in the days after a transient ischaemic attack (TIA). However, estimates of this risk have been inconsistent, possibly due to differences in study methodology. We therefore conducted a critical review and meta-analysis of studies of the early risk of stroke after TIA.

Methods: Articles reporting the risk of stroke within 90 days of TIA were identified from MEDLINE and EMBASE (to November 2006) and relevant reference lists and reviews. A priori criteria were set to identify studies with the most appropriate methodology: adequate ascertainment of all TIA patients from a defined at risk population; inception to the study as soon as possible after TIA; and robust prospective follow up. A random effects model was used to estimate early stroke risk from this dataset.

Results: Search revealed 106 potentially relevant articles of which 18 reported stroke risk within 90 days of TIA. Of these, 11 studies did not meet the above quality criteria: selective recruitment (7); part of a treatment trial (3); incomplete data reporting (4); and review articles (4). Two studies did not report baseline TIA characteristics (3). One study was excluded due to a difference in study population (1). Mean age of TIA patients was 73 years (95% CI 72-74 years) and 62% were male (95% CI 58-67%). Male gender was associated with a higher risk of stroke. Added to the risk for combined risk factors (male gender, recent TIA, and high blood pressure), the relative risk of stroke was 3.2 (95% CI 1.3-7.8) for patients with at least one risk factor compared to patients with none. The early risk of stroke was higher in patients with TIA and carotid stenosis, but there was no relationship between risk factors and stroke location or severity.

Poster Session

Meta-analysis and review papers
Methods:
a case-control approach to estimate the strength of association between MBs and

Results:
The pooled analysis included 501 patients with ICH and 1249 with

Conclusions: There is currently not enough evidence regarding GP IIb-IIIa in-

Discussion:
The NIHSS and the SSS may be inter-converted; derived conversion
equations may prove useful for both current clinical trials and meta analyses of
completed trials where different measures of impairment may have been used.

DOES REPETITIVE TASK TRAINING AFTER STROKE IMPACT ON FUNCTION?
University of Central Lancashire, Preston, Lancashire, United Kingdom

Background: The repetition of context-specific functional movement is a common
component of current approaches to stroke rehabilitation.

Conclusions: There is currently not enough evidence regarding GP IIb-IIIa in-
hibitors therapy in acute ischemic stroke. Results from ongoing trials will help
to understand the risk to benefit ratio of these agents. Taking into account the
recent and premature interruption of the ABESTT II trial due to a high rate
of intracranial hemorrhages, it seems crucial to see whether the early risk of
intracranial hemorrhage is offset by a benefit on long-term death and disability.

IMPAIRMENT/SEVERITY MEASURES IN STROKE TRIALS

Meta-analysis of review papers

THE PRESENCE OF CEREBRAL MICROBLEEDS ASSOCIATED WITH
ANTIPLATELET OR WARFARIN-ASSOCIATED INTRACEREBRAL
HAEMORRHAGE?
C.E. Lovelock, A. Chandratheva, J.N. Redgrave, D. Briley, P.M. Rothwell
University of Oxford, Oxford, United Kingdom

Background: Cerebral microbleeds (MBs) are common in patients with TIA and
ischaemic stroke (IS) in whom antiplatelet agents or warfarin would normally be
indicated. MBs are potential markers of increased risk of medication-associated
intracerebral haemorrhage (ICH). In the absence of large cohort studies, we used
a case-control approach to estimate the strength of association between MBs and
medication-associated ICH.

Methods: We compared the frequency of MBs in 1) antiplatelet or warfarin-
associated ICH with that in antiplatelet or warfarin-associated ischaemic stroke
(IS); 2. warfarin-associated ICH and antiplatelet-associated ICH versus spontaneous
ICH. We studied our own cohort of 309 patients with stroke (43 with ICH) and
pooled our results with all available data from other groups.

Results: The pooled analysis included 501 patients with ICH and 1249 with
IS. In ICH, MBs were more frequent in warfarin-users compared with non-users
(OR 1.6, 95% CI 1.2-2.0, p<0.001), but no more frequent in antiplatelet-users
versus non-users (OR 1.0, 95% CI 0.92-1.28, p=0.34). In IS, rates of MBs were similar
in warfarin-users (OR 1.05, 0.68-1.62, p=0.82) and antiplatelet-users (OR 1.17,
0.96-1.41, p=0.11) compared to non-users. MBs were more frequent in ICH vs IS,
but the difference was greatest among warfarin-users (OR 2.81, 1.34-5.91) than
antiplatelet users (OR 1.63, 1.14-2.35).

Conclusion: Antiplatelet use was not associated with an excess of MBs in patients
with either IS or ICH, but there was an excess of MBs in warfarin-associated ICH,
which was not found in warfarin-associated IS. These preliminary data suggest that
antiplatelet use is unlikely to be very harmful in patients with MBs, but more data
are required on the safety of warfarin in this group.

Background:
Glycoprotein (GP) IIb-IIIa inhibitors block the final common path-
way to platelet aggregation antagonising with receptors that bind fibrinogen
molecules forming bridges between adjacent platelets.

Methods: To assess efficacy and safety of GP IIb-IIIa inhibitors in acute ischemic
stroke with a systematic review.

Selection criteria: We aimed to analyze randomized controlled trials comparing
GP IIb-IIIa inhibitors with placebo in patients with acute ischemic stroke. Only
patients who started the treatment within six hours of stroke onset were included.

Main results: Two trials involving 474 patients were included. Only data for
414 patients treated within six hours were considered. Patients were treated with
intravenous abciximab or placebo. Treatment with abciximab was associated with
a non-significant reduction of death and dependency combined (odds ratio (OR)
0.79. 95% confidence interval (CI) 0.54 to 1.17) and of death alone (OR 0.67; 95%
CI 0.36 to 1.25). Treatment with abciximab was associated with a non-significant
increase of symptomatic intracranial hemorrhages (OR 4.13; 95% CI 0.86 to 19.67)
and of major extracranial hemorrhages (OR 1.51; 95% CI 0.23 to 9.12).

Conclusions: There is currently not enough evidence regarding GP IIb-IIIa in-
hibitors therapy in acute ischemic stroke. Results from ongoing trials will help
to understand the risk to benefit ratio of these agents. Taking into account the
recent and premature interruption of the ABESTT II trial due to a high rate
of intracranial hemorrhages, it seems crucial to see whether the early risk of
intracranial hemorrhage is offset by a benefit on long-term death and disability.

4 Meta-analysis and review papers

IS THE PRESENCE OF CEREBRAL MICROBLEEDS ASSOCIATED WITH
ANTIPLATELET OR WARFARIN-ASSOCIATED INTRACEREBRAL
HAEMORRHAGE?
C.E. Lovelock, A. Chandratheva, J.N. Redgrave, D. Briley, P.M. Rothwell
University of Oxford, Oxford, United Kingdom

Background: Cerebral microbleeds (MBs) are common in patients with TIA and
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a case-control approach to estimate the strength of association between MBs and
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Methods: We compared the frequency of MBs in 1) antiplatelet or warfarin-
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0.96-1.41, p=0.11) compared to non-users. MBs were more frequent in ICH vs IS,
but the difference was greatest among warfarin-users (OR 2.81, 1.34-5.91) than
antiplatelet users (OR 1.63, 1.14-2.35).

Conclusion: Antiplatelet use was not associated with an excess of MBs in patients
with either IS or ICH, but there was an excess of MBs in warfarin-associated ICH,
which was not found in warfarin-associated IS. These preliminary data suggest that
antiplatelet use is unlikely to be very harmful in patients with MBs, but more data
are required on the safety of warfarin in this group.

5 Meta-analysis and review papers

INTERCONVERSION OF NATIONAL INSTITUTES OF HEALTH STROKE SCALE (NIHSS) AND SCANDINAVIAN STROKE SCALE (SSS)

5 IMPAIRMENTS/SEVERITY MEASURES IN STROKE TRIALS
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Introduction: The National Institutes of Health Stroke Scale (NIHSS) and Scan-
dinavian Stroke Scale (SSS) are both validated measures of impairment, share
common domains and have been used in many acute stroke trials. However,
they differ in their direction of measurement, the weighting given to individual
items, and inclusion of specific measures. Here, we describe methods for their
interconversion.

Methods: We included 5 acute stroke trials from the Virtual International Stroke
Trials Archive (VISTA) where both NIHSS and SSS had been recorded at baseline;
data were also available at 90 days post randomisation for each trial. Median scores
were used to populate conversion tables. Equations were then developed using
linear regression (both unadjusted and adjusted for age and sex) using 50% of the
data. The remaining 50% of data were used to test the accuracy of the models
produced. The trials all excluded patients with mild impairment (e.g. NIHSS<3,
SSS<50) and had exclusion criteria that will have confounded impairment, e.g.
type and amount of task practice, but not time since stroke.

Results: Fitted models at baseline were NIHSS=25.90733-0.43909xSSS (n=977,
R2=0.61; prediction error (PE) -0.1, p=0.38), and SSS=50.6252-1.64148xNIHSS
(n=879, R2=0.62; PE 0.1, p=0.67). 90 day models were NIHSS=22.71944-
0.38365xSSS (n=792, R2=0.81, PE 0.3, p=0.003), and SSS=86.76262-2.23975xNIHSS
(n=770, R2=0.79, PE 0.2, p=0.49). Adjustment for age and gender did not materi-
ally improve R2 values.

Discussion: The NIHSS and the SSS may be inter-converted; derived conversion
equations may prove useful for both current clinical trials and meta analyses of
completed trials where different measures of impairment may have been used.
7 Meta-analysis and review papers

WHAT ARE THE SOCIAL CONSEQUENCES OF STROKE FOR WORKING AGE ADULTS?
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Background: A significant proportion of strokes occur in people of working age but the social consequences for this group are not well known. Younger adults may have different social responsibilities and commitments than older adults, so consequences may be dissimilar. We conducted a literature review to identify what is known about the impact of stroke on working age adults.

Method: Electronic databases PubMed and Medline (1950-2006) were searched using key words: stroke, working age, young adult, return to work, social consequences and outcomes. Inclusion criteria: English language, peer-reviewed publication. Exclusion criteria: clinical outcomes, studies on social consequences that did not specify results by age group.

Results: Forty-four quantitative and three qualitative studies were included. Studies varied in selection criteria, sample size, age, outcome measures and time of follow up. All studies reported the proportion of people working at the time of stroke, unable to return to work at follow up. This ranged from 15-99%. Five studies reported other social consequences. Problems with family relationships were reported in 5 studies. Between 5-76% of people reported sexual problems (3 studies). Between 24-33% of the responders had financial difficulties (3 studies). In 2 studies, 2% and 18% of responders had a change in living arrangements.

Discussion: Studies have predominantly focused on return to work; other social consequences of stroke for working age adults are under researched. Wide variations in prevalence of problems reflect methodological differences. Further research is needed to identify other social consequences for this group. Such data would be useful in developing appropriate services for working age adults with stroke.

8 Meta-analysis and review papers

EFFECT OF ANTHYPERTENSIVE AGENTS ON CEREBRAL BLOOD FLOW: A SYSTEMATIC REVIEW
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Background: High blood pressure (BP) is common in acute stroke and is associated independently with a poor outcome. Lowering BP might improve outcome provided it does not reduce cerebral blood flow (CBF) in the presence of dysfunctional cerebral autoregulation.

Methods: We performed a systematic review of randomised controlled trials that administered antihypertensive agents within 7 days of acute stroke. Trials were identified from PubMed, Embase and Web of Science, and rejected if they did not publish numerical data. Data were combined using RevMan and are summarised as confidence intervals (95% CI).

Results: From 13 identified publications, 6 trials met the inclusion criteria with 4 trials providing data suitable for analysis. A variety of antihypertensive agents were used in the trials identified: angiotensin converting enzyme inhibitor (ACE-I, 1 trial), angiotensin receptor antagonist (ARA, 1), calcium channel blockers (CCB, 3) and glyceryl trinitrate (GTN, 1). In 3 trials CBF was measured in the first day of assessment and at discharge, using Ellman's method. In one study CBF was measured in the first day of assessment and at discharge, using xenon CT.

Discussion: In the four trials providing data, the antihypertensive agents did not alter CBF. There was no reduction in CBF in 1 trial. There was a trend towards increased CBF in 3 trials.

Conclusion: There is no evidence that antihypertensive agents alter CBF in the presence of dysfunctional cerebral autoregulation.
was available in 87 patients (age 66±10 yrs). MRI scans were assessed for unco-hippocampal DWI positive lesions (verified by ADC maps), white matter hyperintensities (WMH), and chronic ischemic infarcts. Vascular risk factors, precipitating events, and other ancillary investigations (duplex sonography, EEG, ECG, laboratory findings) were recorded.

**Results:** DWI positive lesions were found in 10 individuals (11.5%; age: 68.3±5.4 yrs; F/M: 8:2). The interval between symptom onset and MRI was non-significantly shorter in this group compared to DWI negative subjects (age 65±11.4 yrs; F/M: 46:31; interval: 59±30 vs. 79±57 hrs; p=0.06). The vascular risk profile was generally favorable in the entire cohort and did not show significant between-group differences. The proportion of subjects with confluent WMH was also not significantly different between subgroups (10.0% vs. 11.7%). Chronic ischemic infarcts were present in 2 subjects only (all DWI negative).

**Conclusion:** These findings appear to argue against a “classical” vascular mechanism of DWI positivity in TGA patients. However, the overall low frequency of DWI lesions observed and subgroup differences in the delay between symptom onset and MRI potentially limit this conclusion.

4 Dementia/cognition

**COGNITIVE STATUS IS IMPAIRED IN APPARENTLY RECOVERED STROKE SURVIVORS**

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Cognitive status of stroke patients with total functional recovery remains unknown. We aim to determine different cognitive functions in “recovered” stroke patients at six months.

**Methods:** We prospectively studied consecutive stroke patients with a modified Rankin Scale score (mRS) ≤1 at six months. All patients underwent a complete neuropsychological evaluation including: attentional, information processing speed, visuospatial, learning and memory, language and executive functions. All scores were adjusted by age, education and were standardized (0 to 100). Global cognitive status was defined as the mean score of all individual functions. Scores <40 determined impaired functions. Clinical and demographic data were also collected.

**Results:** 47 patients were studied, mean age was 65 and 28% were female. Mean time of education was 9 years. 38 (81%) patients had an ischemic stroke, of them 4 had a TIA. On admission median NIHSS score was 3, at discharge 1 and 23% had a mRS of 1 at 6 months. Most subjects (59.6%) had a global cognitive impairment (GCI). Language was affected only in 4% of patients. The remaining cognitive functions were impaired in more than 50% of subjects being executive ability the most affected (72%). GCI was higher among patients with intracerebral hemorrhage (100% Vs 50%, p=0.006). Other variables associated with GCI were: previous stroke (p=0.027) and no-smoking (p=0.032). Initial stroke severity was not associated with GCI (p=0.57).

**Conclusions:** In most self-sufficient stroke survivors with apparently no limitations in daily activities a neuropsychological evaluation prove an important cognitive impairment. Commonly used outcome measures may be insufficient to evaluate full recovery.

5 Dementia/cognition

**PLASMA C-REACTIVE PROTEIN AND COGNITION IN SINGAPOREAN ISCHEMIC STROKE PATIENTS**

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**Background:** Studies have shown the prognostic value of plasma C-reactive protein (CRP) for recurrent vascular events and disability after stroke. High CRP is also predictive of cognitive decline and dementia in population based studies. However, the relationship between CRP and cognition in stroke has not been investigated. We aimed to determine if baseline CRP predicted for baseline cognitive impairment or subsequent cognitive impairment in Singaporean stroke patients.

**Methods:** 506 consenting patients admitted with recent acute ischemic stroke (59% male, 80% Chinese, 10% Malay and 9% Indian) had blood sampled for CRP levels. Cognitive impairment was assessed acutely and between 6 to 12 months after baseline. Cognitive impairment was determined using predetermined education adjusted cut-offs.

**Results:** 401 patients had acute baseline cognitive assessments. At follow-up, 33 patients had died and 191 were either uncontactable or refused follow-up, thus 282 patients had cognitive status assessed at a mean of 7.8 months after stroke. Univariate analysis showed that impaired cognition at baseline was associated with age, gender, CRP levels, stroke sub-type, and hyperlipidemia. Logistic regression showed that age, gender, CRP and stroke subtype were independent predictors of baseline cognitive impairment. Impaired cognition at follow-up was associated with baseline cognitive status, age, and gender using univariate analysis. Logistic regression analysis showed that only age and acute cognitive status were independent predictors of cognitive impairment at follow-up.

**Discussion:** High acute phase CRP levels were associated with cognitive impairment acutely after stroke, but not at follow-up. Steady-state CRP levels may be a better marker of risk of cognitive impairment after stroke.