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Abstracts
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Schweizerische Neurologische Gesellschaft

P 01 Fonctions exécutives et contrôle de la marche

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Objectif: Les troubles de la marche sont fréquents chez les patients déments. Un défaut attentionnel lié à une atteinte des fonctions exécutives semble en être à l'origine. Le but est d'évaluer l'influence de différentes tâches attentionnelles sur la marche de sujets avec syndrome dysexécutif.

Méthode: Les paramètres de marche ont été enregistrés chez 16 sujets avec atteinte des fonctions exécutives à vitesse lancée en condition de marche standard et de doubles tâches avec le système d'analyse de marche GAITRite®.

Résultats: Les sujets (83,6 ± 7,9 ans) présentaient un Mini Mental State de 22,1 ± 3,6 et une Batterie rapide d'efficience frontal de 9,1 ± 3,4 dont les étiologies se répartissaient entre maladie d'Alzheimer, démence vasculaire et démence mixte. La valeur moyenne et le coefficient de variation (CV) du temps du cycle de marche montraient une augmentation entre les tâches de marche standard et de double tâche ($p < 0,05$) et ces augmentations dépendaient du niveau de difficulté de la tâche cognitive ($p < 0,05$). Ces changements étaient plus importants pour le CV.

Conclusions: Le contrôle de la marche en condition de double tâche semble dépendre des fonctions exécutives. Par ailleurs, le CV pourrait représenter un marqueur intéressant du contrôle de la marche en rapport avec les fonctions exécutives.

P 02 Activation of visual and motor areas during imaginary movements of the phantom but not the paretic limb: an fMRI investigation of the third arm phenomenon

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Background: The phantom limb phenomenon which occurs generally after right hemisphere lesions takes the form of a supernumerary limb which duplicates the paretic one. As following amputation, this phenomenon whose illusory nature is correctly self-criticised is related to the experience of the paretic limb before injury.

Objective: To verify the multi-sensorial nature of the phenomenon of the supernumerary phantom limb illusion using an fMRI motor paradigm.

Experiment: A 64-year-old woman presented, after a right capsule-lenticular haemorrhage, left hemiplegia, anaesthesia, hemianopia, neglect and a supernumerary phantom limb that could be visually and kinaesthetically felt. fMRI was analysed during imaginary movement (IM) of the healthy, paretic and phantom limb.

Results: IM and real movements (index-thumb) of the healthy hand showed the expected left areas. IM of the paretic hand activated right primary motor and pre-motor cortex. IM of the phantom limb (scratch the right cheek / left cheek) activated the right primary motor, pre-motor, the SMA and the left visual cortex. The same analysis with the paretic limb failed to reveal visual activation.

Conclusions: Contrary to imaginary displacement of the paretic limb which activated mainly motor regions, the phantom limb additionally activated left visual areas. This finding confirms the multi-sensorial dimension of this illusion which persisted during several months after stroke (SNF grant no 325100-118362).

P 03 Vascular risk factors and morphometric data in cervical artery dissection: a matched case-control study

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Background: Limited knowledge exists on risk factors in spontaneous cervical artery dissection (sCAD).

Patients and methods: In this case-control study, vascular risk factors, body weight, body height and BMI of 239 patients obtained from a prospective sCAD registry were compared with 516 age- and sex-matched healthy controls. Gender-specific analyses were performed.

Results: Mean body height was increased in sCAD patients compared with controls (171.3 cm [SD 8.6] vs 167.7 cm [SD 8.9]; $p < 0.0001$) and sCAD patients had a significantly lower mean BMI than healthy controls (22.9 [SD 3.3] kg/m^2 vs 24.5 [SD 4.2] kg/m^2; $p < 0.0001$). Mean body weight (67.5 [SD 12.2] kg vs 69.3 [SD 14.6] kg; $p = 0.312$) and the overall frequency of hypertension (17 vs 19%, $p = 0.565$), diabetes (1 vs 1%, $p = 0.918$), current smoking (27 vs 31%, $p = 0.22$), past smoking (17 vs 19%, $p = 0.648$) and hypercholesterolaemia (61 vs 57%, $p = 0.35$) did not differ significantly between sCAD patients and controls. Mean total plasma cholesterol level was identical in patients and controls (5.5 mmol/l, SD 1.1). Gender-specific subgroup analyses showed similar results for men and women.

Conclusion: Our results indicate that patients with sCAD have higher body height and lower BMI than controls while major vascular risk factors were similar in sCAD patients and controls.

P 04 Thrombolysis in childhood ischaemic stroke. Report of two cases and review

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Background: Controlled randomised trials (CRT) have proven the efficacy of intravenous (IVT) and intraarterial (IAT) thrombolysis in adults with ischaemic stroke. No CRT examining thrombolysis in children has yet been conducted.

Methods: We report two children who underwent IAT for acute ischaemic stroke and undertook a review of thrombolysis for childhood stroke.

Results: A 12-year-old boy with hemiplegia and aphasia due to carotid T-occlusion was treated with intraarterial Urokinase five hours after symptom onset. The C1 ICA and the A1 ACA segment were partially recanalised. The child remained hemiplegic and aphasic and died the following day because of malignant MCA infarction.

A 9-year-old boy with severe tetraparesis and intermittent decerebrate posture with basilar artery (BA) and posterior cerebral artery occlusion was treated by IAT (750 000 IU Urokinase) 12 hours after symptom onset. The BA was partially recanalised and a rapid clinical improvement was observed. Three months later the child had slight dysmetria and moderate neuropsychological deficits (attention and executive functions).

Literature review: In 15 children (including our two cases) who underwent IVT (n = 6) or IAT (n = 9) adequate data were available. One asymptomatic and no symptomatic intracranial haemorrhage was observed. 14 children survived, and 10 had a good outcome (mRS score 0 or 1).

Conclusions: Thrombolysis in children with ischemic stroke is feasible and seems to be safe.

P 05 Mechanisms of multidrug transporter mediated antiepileptic drug resistance in temporal lobe epilepsy

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Mesial temporal lobe epilepsy (MTLE) with hippocampal sclerosis shows resistance to antiepileptic drug (AED) treatment, affecting about 60% of patients. Pharmacoresistance might be due to restricted AED penetration into epileptogenic tissue through overexpression of multidrug transporters of the ATP-binding cassette (ABC) protein superfamily at the blood-brain barrier (BBB). Here, we assess the substrate specificity of the ABC transporters MDR1 (ABCB1), MRP1 (ABCC1) and MRP2 (ABCC2), which are abundant at the BBB, to clarify their role in AED resistance. We have established an in vitro BBB model using tetracycline-dependent inducible overexpression of human ABC transporters in stably transfected polarised epithelial cells (MDCK). Human MDR1 and MRP2 localise to the apical and MRP1 to the basolateral membrane of MDCK cells; their expression is quantified by Western blot and barrier integrity (functional tight junctions) is shown by high transepithelial electrical resistance. Drug transport across this BBB model is measured in the basolateral and apical compartment as well as within MDCK cells by LC-MS/MS analysis. Human MDR1 is functional and vinblastine, a known MDR1 substrate, is extruded with a corrected transport ratio (cTR) of 7.06, more efficiently than published previously. Carbamazepine (CBZ) was found not to be a substrate of MDR1 (cTR = 0.71). We will extend these results to MRP1 and MRP2 and test lamotrigine as another first-line AED in the treatment of MTLE.

P 06 Loss of hypocretin (orexin) neurons with severe traumatic brain injury

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Background: Traumatic brain injury (TBI) frequently results in excessive daytime sleepiness and hypersomnia, but the underlying causes of posttraumatic sleep-wake disturbances are unknown. Narcolepsy is caused by a loss of the hypocretin-producing neurons in the hypothalamus, and in the first days after TBI cerebrospinal fluid levels of hypocretin are often very low, suggesting injury to the hypocretin system. Similarly, six months after TBI, there is an association between low cerebrospinal fluid hypocretin levels and excessive daytime sleepiness.

Methods: We immunostained hypothalamic sections and counted hypocretin neurons from 4 deceased patients with severe TBI and from 4 control subjects. Control hypothalami contained an average of 44.838 ± 3.988 hypocretin neurons (range 40.700–49.625). In TBI patients the number of hypocretin neurons ranged from 23.800 to 47.600 (mean 32.106 ± 7.618), representing an approximately 30% cell loss ($p < 0.001$). Cell densities in TBI patients were reduced by 27%, and perivascular spaces frequently contained hypocretin-immunoreactive debris. In controls the number of hypocretin neurons differed by no more than 2–4% between the right and left hypothalami, but in TBI brains cell counts varied by 10–29% between sides, possibly reflecting asymmetric trauma.

Conclusion: The loss of hypocretin neurons in patients with severe TBI suggests that disturbed hypocretin signalling may contribute to posttraumatic sleep-wake disturbances.

P 07 Hypocretin signalling in Behçet's disease with diencephalic lesions and increased sleep propensity

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Background: Behçet's disease, a chronic inflammatory multisystem disorder, may manifest with central-nervous-system symptoms

and is occasionally associated with increased sleep propensity. Based on clinical and radiological observations, it has been hypothesised whether hypothalamic dysfunction might underlie these sleep-wake disturbances.

Case report: In this study we report two patients with Behçet's disease, excessive daytime sleepiness, hypersomnia and diencephalic lesions on magnetic resonance tomography. In one patient with hypersomnia the cerebrospinal fluid level of the hypothalamic and wake-promoting neuropeptide hypocretin (orexin) was low in the phase of high disease activity, but recovered under treatment, in parallel with clinical symptoms and radiological signs. In the other patient with fatigue but no hypersomnia normal hypocretin levels were observed.

Conclusions: Our findings indicate that transiently disturbed hypothalamic-hypocretinergic signalling might underlie increased sleep propensity in Behçet's patients with diencephalic lesions.

P 08 Repetitive pertussis toxin administration protects against experimental autoimmune encephalitis

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Objective: Pertussis toxin (PTX) in association with myelin antigens is commonly used to induce experimental autoimmune encephalitis (EAE). Known PTX effects are activation of both T cells and antigen-presenting cells and permeabilisation of the blood-brain barrier (BBB). We addressed the question whether continuous PTX pre-treatment could alter the course of MOG-induced EAE.

Methods: C57BL/6 mice were injected weekly over 6 months with 300 ng PTX i.v. EAE was induced in PTX pre-treated (PT; n = 8) and non-PTX pre-treated (NPT; n = 10) with MOG35-55.

Results: Before EAE induction, T-cell proliferation to specific (PTX) and unspecific (PHA) stimuli was similar in both groups, excluding any toleration effect. After immunisation EAE was significantly delayed and ameliorated in the PT group compared to the NPT group. At a progressed EAE stage T-cell proliferation following PTX stimulation was not different between groups. In contrast, PT mice showed a significantly reduced T-cell proliferation and IFN-g production in response to MOG35-55 stimulation. When PTX was used as recall Ag, a strong IL-10 induction was found in the splenic population of the PT group. Furthermore, we observed by FACS a strong PTX-inducible expansion of CD4+-CD25+-Foxp3+ cells in the PT group before EAE induction.

P 09 Role of hepatocyte growth factor/scatter factor in experimental autoimmune encephalomyelitis

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Objective: Multiple sclerosis (MS) is a chronic inflammatory demyelinating disease of the central nervous system (CNS) that commonly begins with alternation of relapse and recovery. Experimental autoimmune encephalitis (EAE) is an MS model used to explore the pathogenesis of inflammation, demyelination and axonal loss. Hepatocyte growth factor/scatter factor (HGF/SF) is a high molecular weight growth factor known to induce chemoattraction and differentiation of oligodendrocyte precursor cells (OPC), protection of axons and modulation of inflammation. We hypothesise that HGF/SF specifically delivered in the CNS will inhibit EAE course.

Method: We induced EAE in transgenic (Tg) mice that specifically overexpressed HGF/SF in the CNS (C57BL/6 NSE-HGF Tg mice). Age-/gender-matched wild-type littermate mice were used as control. Immunisation was done with MOGaa35-55 peptide in CFA s.c. supplemented with pertussis toxin (PT) i.v. at day 0 and 2.

Results: EAE was significantly attenuated in C57BL/6 NSE-HGF Tg mice. This effect is not mediated through modulation of the inflammation in the periphery. A decrease of both inflammatory lesions and demyelinated plaques was demonstrated in the spinal cord by histology. In addition, a specific inhibition of $CD4^+$ T cells and dendritic cells within the CNS was demonstrated by FACS in NSE-HGF Tg mice. The protective effect of HGF/SF may be explained through both CNS in situ inhibition of inflammation and/or myelinoprotection.

P 10 Alien-hand syndrome in right hemispheric stroke may be masked by neglect: a case report

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Alien-hand syndrome (AHS) is characterised by seemingly goal-directed limb movements without conscious will, which has been reported mostly with left hemispheric lesion and only in right-handed patients. It has been argued that different motor organisation of left-handedness may prevent AHS. Furthermore, in right hemispheric lesions the syndrome may be masked by neglect.

Here we report a 58-year-old left-handed woman with AHS of her left dominant upper limb after extended ischaemic lesion of the right hemisphere involving medial frontal cortex. Initially, the patient showed left-sided hemiplegia. Detailed neuropsychological evaluation revealed multimodal hemispatial neglect, executive dysfunction and visuoconstructive deficits. Handedness as assessed by Edinburgh Handedness Inventory was clearly left lateralised (laterality quotient: –44). Hemiplegia and subsequently neglect rapidly improved during the first four weeks of neurorehabilitation. With motor recovery the patient gradually developed involuntary movements of her left arm including mirror movements and impulsive groping toward objects. The patient personified her arm by giving it a name and perceived it as having a mind of its own.

Based on this case report we conclude that left-handedness does not preclude AHS as previously assumed. However, the development of AHS parallel to resolving neglect as seen in this patient supports the notion that neglect may frequently mask AHS associated with right hemispheric damage.

P 11 Executive deficits in Parkinson's disease with impaired haptic information processing: relationship to prefrontal dysfunction

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The neurocognitive profile and its relationship to prefrontal dysfunction were studied in 12 patients with non-demented Parkinson's disease and 12 age-matched controls. We previously reported that impaired tactile object discrimination in this patient group may be related to executive dysfunction, notably impaired working memory, as evidenced by Principal Component (PC) analysis of ^{15}O-labeled water Positron Emission Tomography (PET) data. The statistical evaluation of the performance in a neuropsychological test battery, administered at the time of the PET stimulation task, demonstrated significantly decreased scores for verbal learning (Odds ratio, OR = 5.48, 95% confidence interval, CI 1.22–24.61; p = 0.03) and verbal recall (OR 2.05, 95% CI 1.08–3.88; p = 0.03) in the patient group as compared with normal volunteers, other cognitive functions, particularly working memory, being relatively preserved. Furthermore, Spearman's ranking correlation showed a significant correlation of deficient verbal recall with the PC scores of a prefrontal network (r = –0.69; p = 0.02). A correlation at the level of a trend was also found with haptic discrimination scores (r = –0.53; p = 0.08).

Concluding, impaired tactile object recognition in Parkinson's disease is likely associated with executive deficits due to prefrontal dysfunction and, the findings suggest that working memory related to particular aspects of object information may be selectively affected.

P 12 ^{18}FDG-PET/CT and ultrasonography of the carotid plaque: a pilot study on symptomatic and asymptomatic patients with 50–99% stenosis

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Purpose: The aim of our study was to compare 50–99% carotid stenosis by PET/CT and US in symptomatic and asymptomatic patients.

Methods: 8 patients (5 males, 76 ± 10 years) with 50–99% carotid stenosis were enrolled in this pilot study. Symptomatic patients were considered having a carotid ischaemic stroke/TIA after complete work-up. Metabolic activity of carotid lesions was measured by ^{18}FDG-PET using maximal standardised uptake value (SUV) with an arbitrary cut-off value of 1.5 for significant activity (suggested by published data). Patients also underwent Duplex US, MRI-MRA and microembolic signal detection (MES) according to standardised protocols. Degree of stenosis was determined by combination of US, MRA and CTA data and then categorised into moderate (50–69%) and severe (70–99%).

Results: 5 patients were symptomatic (4 strokes, 1 amaurosis fugax) and 3 of them (60%) had severe carotid stenosis. 2/3 (67%) asymptomatic ones had severe stenosis. Among the stroke cases, 3 (75%) were PET+ with embolic lesions on MRI. One subject was PET– and had a typical watershed stroke. Asymptomatic patients were all PET–. 2 symptomatic patients had positive MES detection but none of the asymptomatic ones. Considering severe stenosis (n = 5), only one subject was PET+ whereas 2/3 (66%) had a PET+ in the moderate stenosis group.

Conclusion: This pilot study suggests that hypermetabolic activity of carotid plaques might correlate with the presence of symptoms and is not related to the degree of stenosis.

P 13 Thrombolysis in brain ischaemia (TIBI) flow grade predicts response to intravenous or combined intravenous and intra-arterial thrombolysis in patients with acute ischaemic stroke

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Purpose: To assess early recanalisation and outcome in patients undergoing intravenous (IV) or combined intravenous and intra-arterial (IV-IA) thrombolysis guided by transcranial colour-coded duplex sonography (TCCD).

Methods: Stroke patients <3 hours were monitored with TCCD. Thrombolysis in brain ischaemia (TIBI) classification was used to assess flow at baseline and during therapy. In absence of reperfusion IA thrombolysis was administered otherwise IV thrombolysis was completed. 3-month outcome was assessed by mRS (0–2 favourable/3–6 unfavourable).

Results: 54 patients underwent IV (n = 33) or IV-IA (n = 21) thrombolysis. A TIBI 3 baseline flow was the best parameter associated with early recanalisation (OR 24.7; 95% CI 3.01–202.00; p = 0.003) whereas absent flow significantly reduced the likelihood to reperfuse (OR 0.14; 95% CI 0.03–0.70; p <0.02). After 30 minutes, IV thrombolysis achieved some recanalisation in 17 (61%) patients. At this point, TIBI 3 predicted a favourable outcome in 70% of cases. Only 3/10 patients with a TIBI 0 had a favourable outcome in the IV-IA group. However, for those with a TIBI >0, further IA thrombolysis allowed a favourable outcome in 72% of the cases (OR 0.16; 95% CI 0.02–1.06; p = 0.05).

Conclusions: Recanalisation rates increased in proportion with baseline TIBI values. A TIBI 3 flow was the best predictor of early recanalisation during IV thrombolysis, whereas chances to reperfuse were the lowest with a TIBI 0. 3-month outcome in this latter group was statistically worse.

P 14 Transient cortical blindness following coronary angiography

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A 32-year-old patient underwent coronary angiography for recurrent atypical chest pain. Coronary artery disease could be excluded by coronary angiography.

Four hours after coronary angiography the patient developed a tension-type headache. Five hours later he presented with an amaurosis on both eyes. On physical examination pupils were equal and both reactive to light, with otherwise normal neurological examination. Bilateral cortical blindness was diagnosed. Computed tomography and magnetic resonance imaging of the brain were normal. Initial electrophysiological examination revealed pathological visual evoked responses on both sides. Electroencephalography showed bilateral focal slowing temporo-parieto-occipital.

The initial sonography of the extracranial vessels showed findings according to a possible dissection or a transient vasospasm of the right vertebral artery in the atlas region. However, magnetic resonance angiography was normal. Within 24 hours vision improved continuously. Usually neuro-ophthalmologic complications of cardiac catheterisation relate to embolism or migraine. In most cases reported so far imaging showed bilateral abnormalities in the occipital lobes. It is speculated that contrast agents disrupt the blood-brain barrier in the occipital lobes exerting a neuronal toxic effect. Our patient showed normal brain imaging whereas initial duplex sonography pointed to vasospasm of posterior cerebral arteries as another possibility of transient amaurosis.

P 15 Gaze direction and facial expression recognition in amygdala-damaged patients

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Past studies have shown a critical role of the amygdala in emotion processing. Bilateral amygdala damage may impair recognition of facial expressions, particularly fear. However, effects of unilateral amygdala damage are more controversial: some findings show that unilateral damage is not sufficient to impair emotion recognition, whereas others show selective deficits after right amygdala damage. Various stimulus or task parameters might account for such differences in results. Here we investigate facial emotion recognition and its interaction with gaze in unilateral amygdala-damaged patients (n = 19), compared to healthy control subjects (n = 10), using computer-generated dynamic face stimuli. These faces could express variable intensities of fear, anger or joy, with different gaze directions. According to appraisal theory, emotion perception depends on self-relevance of the expression. Therefore, a fearful face should be more relevant if gaze is averted than direct, because it signals danger near to the observer; whereas anger with direct gaze should be more relevant than with averted gaze, because it directly threatens the observer. Our results confirm a critical role of the amygdala in emotion and appraisal, showing an interaction between gaze and emotion in controls, but not in patients. Moreover, patients showed a general impairment in emotion recognition, especially for fear, but with different profiles depending on the side of lesion and age of pathology onset.

P 16 Old discussion – new cases: ischaemic aetiology of transient global amnesia?

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We report two cases of transient global amnesia associated with unilateral intensity MRI changes using diffusion weighted imag-

ing (DWI). Case 1 is a 63-year-old woman who developed global amnesia lasting for 36 hours. Case 2 is a 60-year-old man who showed recurrent episodes of transient amnesia and disorientation, the longest episode lasting for more than 24 hours. DWI showed a lesion in the left parahippocampal gyrus (case 1) and two small ischaemic lesions in the right hippocampus (case 2). Neuropsychological examination in the subacute phase revealed residual deficits concerning spontaneous speech, naming, episodic learning and memory (case 1) and memory and complex visual processing (case 2). Unilateral amnesic stroke most commonly involve the vascular territories of the posterior cerebral artery with infarction of the left hippocampus and thalamus, usually presenting impairment of the visual field. In contrast, our cases presented very restricted lesions to the hippocampal area. Therefore, the cases have to be discussed in the light of the conflicting reports concerning transient global amnesia associated with circumscribed DWI signal changes. Special features were the recurrent episodes in case 2 and residual neuropsychological deficits, only ameliorating over months, in both cases. Therefore, the aetiology of the syndrome may be ischaemic in the subgroup with DWI positive findings. Recently, increased vascular risk factors have been verified in such a subgroup.

P 17 Myasthenia gravis: reasons for unsatisfactory outcome revealed by a prospective study

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Objective: To study 41 patients with autoimmune myasthenia gravis (MG) in order to know the percentage and the reasons of unsatisfactory outcome.

Methods: Patients were initially diagnosed with MG and lately referred to our Nerve-Muscle Unit. Outcome was then rated repetitively according to the Myasthenia Gravis Foundation of America Postintervention Status. The complete stable remission, pharmacologic remission, minimal manifestations and improved status were considered as satisfactory outcome. Patients scoring Unchanged (U), Worse (W) or Exacerbated (E) during follow-up were all taken into account and the reasons leading to unsatisfactory responsiveness were analysed.

Results: Unsatisfactory outcome rate was 19.5% (8/41) with 4 patients scoring U, 3 W and 1 E at the last visit, but during the follow-up, 22 patients (54%) were U (3/22), W (8/22) or E (11/22). They were related to insufficient medication (36%), infectious diseases (23%) and no compliance (28%).

Conclusion: This study points out that more than 50% (22/41) of our MG patients had an unsatisfactory outcome during follow-up. Part (60%) of this unsatisfactory outcome could be prevented by tailoring adequate treatments during regular appointments by interested specialists in myology.

P 18 Limb-kinetic apraxia in Parkinson's disease: evidence from diminished response of manual dexterity to dopaminergic treatment

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Patients with Parkinson's disease (PD) often show impaired dexterity although being only minimally bradykinetic pointing to a distinct underlying disorder called limb kinetic apraxia (LKA). The goal of the present study was to investigate the differential dopaminergic response of manual dexterity and bradykinesia supporting this concept.

11 patients (4 women, age range 51 to 75) with PD and wearing off fluctuations were tested in ON and OFF separately. For assessing dexterity the patients were instructed to rotate as fast as possible a Swiss 50-Rappen coin between their thumb, index and middle finger, for bradykinesia to alternately tap index finger and thumb. Performance was measured by frequency of coin rotations (CR) and finger taps (FT) during three 10-second periods. For statistical analysis we used a repeated measures factorial design ($2 \times 2 \times 2$) with the factors medication (ON- vs OFF-state), task (FT vs CR) and handedness (dominant vs non-dominant hand).

Dopaminergic treatment improved dexterity (CR 7.0 + 0.7 in ON vs 5.8 + 0.6 in OFF, mean + SD), however, the effect was considerably less strong than for bradykinesia (FT 24.6 + 2.4 vs 17.3 + 1.9), as indicated by a significant interaction effect ($p = 0.002$) between CR and FT performances, not detected for handiness ($p = 0.598$).

Diminished response of manual dexterity to dopaminergic treatment supports the notion that patients with PD suffer from LKA. The findings are relevant for more targeted rehabilitation strategies.

P 19 BOLD correlates of continuously fluctuating epileptic activity isolated by independent component analysis (ICA): comparison with spike-triggered EEG/fMRI

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Purpose: Combined EEG/fMRI recordings offer a promising opportunity to detect brain areas with altered BOLD signal during interictal epileptic discharges (IEDs), representing the irritative zone. We report on a new approach for the analysis of simultaneous EEG/fMRI applying ICA to detect IEDs and compare the results to spike-triggered EEG/fMRI.

Methods: 20 patients, 15 with focal and 5 with idiopathic generalised epilepsies were examined with EEG/fMRI at 3T MR. Two approaches were used:

ICA-based analysis: ICA factors coding for epileptic activity were convolved with an HRF to predict the BOLD signal.

Spike-triggered analysis: IEDs were manually detected on the EEG and a binary event-related predictor of the BOLD response was generated. Regions with significant correlations with the predictors were interpreted as irritative zone.

Results: ICA-based analysis yielded concordant localisation of the irritative zone with clinical and EEG data in 80% of patients, spike-triggered analysis in 55%. The most prominent differences were observed in mesial temporal lobe epilepsy: 3/3 patients were localised with ICA-based and 0/3 with spike-triggered analysis.

Conclusion: Using ICA-based analysis takes into account that epileptic activity is continuously fluctuating with each spike differing in morphology and topography and that there is subthreshold epileptic activity beside clear IEDs. Thus the usage of a more physiological predictor increases sensitivity of combined EEG/fMRI.

P 20 BOLD correlates of continuously fluctuating epileptic activity isolated by independent component analysis (ICA): use in the differentiation of epilepsy syndromes

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Purpose: Attribution of a specific epilepsy syndrome is crucial for prognostic and therapeutic concerns and sometimes difficult to base on clinical, EEG and sMRI findings. We present an approach using ICA on EEG/fMRI to localise the irritative zone and discuss its clinical value.

Methods: 20 patients, 15 with focal epilepsies (FE) and 5 with idiopathic generalised epilepsies (IGE), were examined with EEG/fMRI. ICA-based factors coding for epileptic activity were convolved with an HRF to predict the BOLD signal. Regions with significant correlations were interpreted as the irritative zone. The results were compared to the presumed zone of seizure onset based on clinical, EEG and structural MR findings.

Results: In 3/3 patients with mesial temporal lobe epilepsy (MTLE), in 4/4 with lateral temporal lobe epilepsy and in 5/5 patients with IGE localisation of the irritative zone by EEG/fMRI was concordant with the clinical data. In all IGE patients a pattern of BOLD correlates including large cortical regions and both thalami was seen. In 4/8 patients with frontal lobe epilepsies (FLE) at least a lateralisation of the irritative zone was possible.

Conclusion: ICA-based EEG/fMRI localised the irritative zone in accordance with clinical and EEG data in 80% of patients. A typical pattern in IGE allowed a differentiation from FE. The unambiguous localisations in MTLE are promising, e.g. in MRI negative cases. Localisation in FLE is limited (as in EEG), probably due to rapid propagation.

P 21 Restless arms syndrome

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We report a unique case of restless arms syndrome masquerading as an allergic skin condition. The patient exhibited symptoms exclusively affecting the upper limbs which, were they located in the legs, would have met all clinical criteria for restless legs syndrome (RLS), including the presence of unpleasant sensory symptoms at rest leading to an urge to move the limbs to alleviate them, circadian variations with nocturnal preponderance of symptoms, associated periodic limbs movement of sleep, severe insomnia and a remarkable and sustained response to dopaminergic agents. Arm restlessness may be associated with RLS in 22–50% of patients, more frequently when RLS is severe, and rarely, RLS may even start in the upper limbs before invading the legs. Furthermore, periodic arm movements during sleep have also been reported in RLS patients. On the other hand, in the case described here, legs remained unaffected more than two decades after symptoms' onset. Because of the selective involvement of the arms only, we propose to label the condition restless arms syndrome (RAS) which, to the best of our knowledge, has not yet been reported. The prevalence of isolated RAS is supposedly low but might be less exceptional than previously thought because, as exemplified in this case, patients may remain misdiagnosed for many years.

P 22 Successful intravenous immunoglobulin treatment in long-standing partial cholinergic dysautonomia: a case report

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A 59-year-old patient developed acute vigorous achalasia, which partly improved by pneumatic oesophageal balloon dilatation. Achalasia was paralleled by new onset of severe constipation and excessive sweating in the thoracic region. A modified thermoregulatory sweat test (TST) confirmed widespread anhidrosis of limbs, head and lower trunk. Quantitative sudomotor axon reflex test (QSART) could not evoke a response. There was no orthostatic hypotension, sympathetic vasomotor function and parasympathetic cardiac innervation were normal. There were no signs of large fibre polyneuropathy, and neuromuscular transmission was normal. Extensive laboratory work-up including screening for vasculitis, paraneoplastic antibodies and antibodies against muscarinic and nicotinergic acethylcholine receptors was normal as was CSF analysis. Thoracic and abdominal CT scan and whole body ^{16}FDG-PET were inconspicuous. Despite negative auto-antibody screening a possibly immune-mediated partial cholinergic dysautonomia was postulated and IVIG treatment started 18 months after symptom onset. 6 weeks later the patient noticed improvement of dysphagia and excessive sweating. Upper gastrointestinal endoscopy confirmed decrease of spastic oesophageal contractions. TST showed a slight enlargement of the sweating skin area and QSART evoked a normal response. Rapidly developing dysautonomia may respond to immunmodulatory treatment even in presence of long-standing symptoms and absence of specific auto-antibodies.

P 23 Lymphoma as a culprit?

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A previously healthy 64-year-old woman developed a two months' history of neck pain, fatigue, weight loss and dizziness. Progression of symptoms occurred with gait disturbance, dysarthria and optical hallucinations. Brain MRI revealed extensive diffuse hyperintense lesions in the mes- and diencephalon along with meningeal swelling suggesting cerebral lymphoma with meningeosis lymphomatosa.

At admission the patient presented with severe gait disturbance, dysmetria and unilateral hearing loss. CSF showed elevated cell count (113 cells/mm^3) and protein (2.25 g/l), decreased glucose (1.39 mmol/l) and elevated lactate (4.42 mmol/l). Oligoclonal bands were positive. Inflammatory markers in the plasma remained normal. The suspected lymphoma could not be confirmed by flow cytometry and abdomino-thoracic CT and PET did not indicate any malignancies. Cerebral angiography showed no vasculitis.

However, search for infectious disease revealed IgM- and IgG-antibodies against *Borrelia burgdorferi* in serum as well as intrathecal IgG. Therefore the diagnosis of a neuroborreliosis was established and treated by intravenous ceftriaxone which resulted in marked clinical improvement.

This case demonstrates that neuroborreliosis may present with considerable variability in symptoms and MR imaging – even with extensive hyperintense lesions. It may be challenging to differentiate from other diseases such as tuberculosis, multiple sclerosis or even malignancies as lymphoma.

P 24 Sodium oxybate in pharmacoresistant chronic cluster headache (CCH)

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Pain attacks in cluster headache (CH) have a striking circadian distribution with a close relation to sleep. Patients with chronic CH (CCH) suffer from severely disturbed sleep and can be refractory to established pharmacotherapy. Sodium oxybate (SO, Xyrem®) is a compound known to affect GABA-ergic transmission and to consolidate sleep. Objective: to evaluate the effects of SO on sleep structure and headache attacks in pharmacoresistant CCH. Three patients (21–47 years) with intractable CCH participated in this open-label prospective study. At baseline they presented with nocturnal (2–6) and diurnal (3–6) pain attacks per 24 hours and with disturbed nocturnal sleep. SO (3.0–8.5 g/night) was administered in two nightly doses, the first at bedtime and the second 4 hours later. Response to SO was monitored by serial polysomnography, hand-wrist actimetry, pain and sleep diaries. Long-term administration of 5–8.5 g SO/night resulted in a persistent reduction of pain frequency (>90%) and intensity (>50%) of nocturnal attacks in 2 CCH-patients. A substantial reduction of pain frequency and intensity during the day was observed in one patient. Mild to moderate side effects (dizziness, vomiting, amnesia, weight loss) occurred. No loss of efficacy was observed at follow-up (longest observation period 19 months) so far. SO improved sleep quality and reduced nocturnal and diurnal pain attacks in pharmacoresistant CCH. The effects of SO on CCH need to be corroborated in a placebo-controlled trial.

P 25 Common semantic processing and specific language effects in the bilingual brain: an event-related potential study

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Background: Semantic priming refers to reaction time (RT) facilitation when a target word is preceded by a semantically related

prime word as compared to a semantically unrelated one. Behavioural studies in bilinguals, which show this effect whether two successive words are in the same language or not, also report a language effect with faster responses to targets in the first (L1) compared to the second (L2) language.

Objective: This study aimed at dissociating the time course of these effects using event-related brain potential (ERP) analysis in bilinguals during a semantic categorisation task.

Methods: High-density ERPs were collected from 13 right-handed bilinguals. Subjects were presented with word pairs (in the same or different languages) and judged if words in each pair were semantically related or not.

Results: RT revealed language and semantic relatedness effects. Relatedness was explained by ERP difference during the 400 ms time range (N400 component). Earlier on, a map segment appeared ~200 ms that was longer in L2 than in L1 conditions. Source analysis showed that this segment activated the left fusiform and the bilateral occipital areas.

Conclusion: Our data show that language and semantic relatedness effects are dissociated in time. Reading in L1 and L2 differs presumably during early word recognition processes. The semantic analysis of words did not differ between languages supporting the view of a common conceptual representation (SNF grant no 325100-118362).

P 26 Cerebellar infarction resulting in ataxia and aphasia due to crossed cerebello-cerebral diaschisis

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Acute crossed cerebellar diaschisis is a well-described but rare disorder due to functional deafference. We present the case of an 84-year-old patient with an ischaemic lesion in the right cerebellum showing aphasia and ataxia at stroke onset. Functional imaging by PET-CT revealed hypometabolism of the left frontoparietal cortex. Diaschisis in the cerebral cortex contralateral to a cerebellar lesion is a phenomenon even more rarely described in the literature.

This striking case report illustrates the immediate remote effect of crossed cerebello-cerebral diaschisis in stroke.

P 27 Multiple sleep latency test measures in narcolepsy and behaviourally induced insufficient sleep syndrome

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Background: Short mean latencies to the first epoch of non-rapid eye movement sleep stage 1 (NREM1) and the presence of ≥2 sleep-onset REM periods (SOREMPs) on multiple sleep latency test (MSLT) occur both in narcolepsy-cataplexy (NC) and behaviourally induced insufficient sleep syndrome (BIISS). NREM1 has been considered an equivalent of drowsiness and NREM2-4/REM of sleep. We aimed to better characterise MSLT findings in NC, BIISS and controls.

Methods: We analysed MSLT data of 60 age-, gender- and body mass index-matched subjects (hypocretin-deficient NC, actigraphy-confirmed BIISS, healthy controls: each 20).

Results: Mean latency (in minutes) to NREM1 was significantly shorter in NC (1.8 ± 1.5) than in BIISS subjects (4.7 ± 2.1; $p < 0.001$) and controls (11.4 ± 3.3; $p < 0.001$). Mean latency to NREM2 was similar in NC (8.6 ± 4.7) and BIISS subjects (8.1 ± 2.7; $p = 0.87$), latency to either NREM2 or REM, however, was shorter in NC (4.4 ± 2.9) than in BIISS (7.9 ± 3.5; $p < 0.001$). Referring to all naps with REM and NREM1/2 sleep, the sequence NREM1-REM-NREM2 occurred in 53% in NC as opposed to 9% in BIISS ($p < 0.01$), reflecting the shorter NREM1-NREM2 latency in BIISS (3.7 ± 2.5) than in NC (6.1 ± 5.87).

Conclusions: Latency to NREM2 does not allow differentiating NC from BIISS, but latencies to either REM or NREM2 were shorter in NC. Our finding of frequent REM prior to NREM2 in NC may indicate that in NC both REM and NREM sleep pressure are altered.

P 28 Preserved otolith function in patients with cerebellar atrophy and bilateral vestibulopathy[1]

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Cerebellar degeneration affects vestibular function. For instance, floccular lesions lead to a reduced capacity to adaptively modify the vestibulo-ocular reflex (VOR) gain, and cerebellar patients may even demonstrate vestibular loss. We report five patients (m = 3, f = 2) with cerebellar disease and reduced gains of the angular VOR, but intact sacculus-mediated myogenic potentials. Preserved static ocular counterroll in roll-tilt positions and gravity-dependent modulation of downbeat nystagmus along the pitch plane demonstrated the integrity of otolith (OL) function in these patients as well. Probably, at least some cerebellar patients seem to exhibit a dissociated pattern of vestibular deficits with impaired semicircular canal (SCC) function, but largely preserved OL function. The exact pathomechanism leading to the vestibular impairment remains unclear: besides a primary multi-system type atrophy involving cerebellar and brainstem vestibular structures, probably also a mechanism of secondary retrograde degeneration of floccular brain-stem target neurons mediating SCC function seems plausible.

1 This study was financially supported by the Swiss National Science Foundation (3200B0-105434), the Betty and David Koetser Foundation for Brain Research, Zurich, and the Bonizzi-Theler Foundation, Zurich.

P 29 Which method correlates best with the presence of cerebrovascular symptoms and/or lesions on MRI in patients with moderate or high-grade carotid stenosis: visual analysis or semi-automated grey-scale based colour mapping of the carotid plaque?

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Background and purpose: To determine, in patients with carotid stenosis, the correlation between plaque morphology assessed by two different ultrasonographic methods and presence of cerebrovascular events and/or lesions on MRI.

Patients and methods: Visual analysis of plaque echogenicity using a five-type classification was performed. Further, a semi-automated grey-scale based colour mapping of the whole plaque and its surface was achieved. Plaque pixels were mapped into 3 different colours according to their grey-scale values: lowest values in red, intermediate in yellow and highest in green.

Results: There were 31 (35%) symptomatic and 58 (65%) asymptomatic carotid stenoses. MRI lesions were present in 27 cases (30%). In a multivariate logistic regression model degree of stenosis ($p = 0.03$) and a predominant red colour on the surface ($p = 0.04$) were independent factors associated with the presence of cerebrovascular events and/or lesions on MRI. Sensitivity and specificity were 80 and 63% respectively, by combining degree of stenosis and colour mapping of plaque surface.

Conclusions: Degree of stenosis and a predominant red colour on plaque surface were independent factors associated with the presence of cerebrovascular events and/or lesions on MRI. No correlation was observed with any particular type of plaque based on visual analysis alone.

P 30 Clinical deterioration of intracerebral haemorrhage after a single dose of aspirin

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The 61-year-old male patient presented an acute sensomotoric hemisyndrome on the left with a hemianalgesia and a dysarthria. He was administered a single dose of 500 mg intravenous aspirin by his general practitioner in the case of a suspected ischaemic stroke and was sent to hospital. The initial cranial computer tomography showed an intracerebral haemorrhage on the right fronto-parietal side. A following computer tomography one day later showed a further extension of the right cerebral haematoma. On the assumption that this increase in the haematoma volume was caused by the administered dose of aspirin a platelet function test was done. It showed a clear increase in ADP-induced maximal platelet aggregation. As a result of this the patient was given a platelet concentrate in order to normalise platelet aggregation time and stop the intracerebral haemorrhage. A follow-up CT on the next day revealed no further progression of haemorrhage. The next platelet function test showed a normal time of platelet aggregation. Other coagulation disorders were excluded. *Conclusions:* A single dose of antiplatelet therapy seems to contribute to the acute clinical deterioration of intracerebral haemorrhage by increasing the ADP-induced maximal platelet aggregation time.

P 31 Transient room tilt illusion after cerebellar strokes

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Room tilt illusions are transient upside-down visions or apparent 90° tilts of the visual field caused by central vestibular disorders, i.e. acute vestibulo-cerebellar or cortical lesions. We report the cases of two patients who complained of a sudden 90° room tilt illusion to the left side, which vanished after twelve hours. Interestingly, the illusion appeared only in the supine position and disappeared after sitting up. Cerebral MRI showed cerebellar infarctions including in both cases the right caudal vermis. Additionally, one patient had a lesion of the right flocculus, the other an infarction of the left vermis. We hypothesise that the vestibular afferents from both sides did not adjust reciprocally to the vertical orientation when the horizontal plane was transformed to the coronal plane, thus causing a mismatch with respect to the visual system. The dependence on head position suggests disturbed vestibular information processing at the level of the flocculus and vermis. Room tilt illusions are typically transient, since the visual system overrides the falsely processed vestibular vertical, i.e. the visual cues dominate and correct for spatial orientation. For correction of mismatched vertical orientation interaction of the visual and vestibular systems within the parieto-insular vestibular cortex may be crucial.

P 32 HSV-Typ II assoziierte Mollaret-Meningitis

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Die häufig «banale» Klinik der Mollaret-Meningitis mit rezidivierenden Symptomen wie Fieberschüben und Schmerzen im Bereich von Kopf und Rücken kann verkannt werden. Wir berichten, wie bei einer Patientin erst nach 14 Jahren rekurrierenden Symptomen die Diagnose gestellt und in der Folge therapiert wurde. Eine Besonderheit bei unserer Patientin war, dass die Meningitisschübe jeweils von anogenitalen Bläschen und Eruptionen begleitet waren.

P 33 Rhabdomyolyse et myalgies d'effort: un déficit en carnitine palmitoyltransférase (CPT II)

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Introduction: Nous rapportons un patient avec myalgies d'effort chez qui un déficit en CPT II fut démontré; il s'agit d'une anomalie héréditaire de l'oxydation mitochondriale des acides gras à chaînes longues à l'origine d'un syndrome musculaire particulier.

Observation: Un adolescent décrivait des myalgies d'effort dès 8 ans, en aggravation progressive avec réduction du périmètre de marche. La phase de récupération était suivie d'une contracture de repos avec urines foncées. A l'effort prolongé, s'installait un déficit moteur, alors qu'au repos, l'examen était normal.

L'EMG avait un pattern myogène. Les CK repos-après effort étaient à 3750/4750 µ/l (n <205). La biopsie musculaire montrait une atrophie des fibres musculaires de type I. Au test d'effort, le rapport Nh3/CK était anormal, et la lactacidémie était normale. Le taux leucocytaire de CPT II effondré. Une mutation composite S113L/413delAG-F448L du gène de la CPT II fut observée.

Discussion: L'intolérance musculaire à l'effort avec myoglobinurie soulève le diagnostic d'une myopathie métabolique bien que certaines dystrophies musculaires puissent s'exprimer ainsi. Le contexte, le dosage biochimique et l'analyse génétique, mais non la biopsie musculaire, permettent le diagnostic de la forme musculaire du déficit en CPT II. Notre forme semble classique, avec une mutation composite nouvelle.

P 34 Impaired discrimination of neutral and emotional facial expressions in Parkinson's disease patients

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The diminished ability of Parkinson's disease patients (PD) to discriminate facial expression of emotions may be related to a reduced sensitivity to valence, intensity or to impaired face processing. Using a forced choice, reaction time (RT) paradigm we examined 14 PD and 10 healthy controls (HC) on their ability to recognise positive and negative valence from facial expressions (i), to discriminate emotion intensity from subsequently presented faces (ii) and to recognise configural changes of neutral faces (iii).

Recognition of positive and negative valence was not different between the two groups. PD were significantly impaired compared to HC in discrimination of emotion intensity regardless of valence. PD were also less accurate in detecting configural changes of neutral faces. In both groups discrimination accuracy varied as a function of valence and emotion salience (ii) and the level of task difficulty (ii, iii). RT varied correspondingly with stimulus valence and emotion salience. In PD, however, effects of task difficulty on RT were significantly reduced and close to invariant.

Impairment of facial emotion intensity discrimination may occur together with a breakdown of configural face processing in PD. We found no evidence of a categorical emotion perception deficit. The specific task-level invariance of RT during sequential stimulus discrimination may disclose reduced dynamics of demand-dependent allocation of cognitive resources.

P 35 Orgasmolepsy

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Introduction: Strong positive emotions are triggers for cataplexy in patients with narcolepsy-cataplexy (NC). Cataplexy during sexual intercourse and orgasm (orgasmolepsy) has been reported rarely.

Objectives: To describe frequency and features of loss of muscle tone during sexual intercourse in a series of NC-patients, patients with various sleep disorders and healthy controls (C).

Patients and methods: Review of standardised sleep questionnaires of 75 subjects (29 with NC, 26 with mixed sleep disorders with EDS and 20 controls) followed by a clinical interview.

Results: Orgasmolepsy was reported by three NC patients (two female, one male), one male patient with behaviourally induced sleep insufficiency (BIISS) and none of the healthy controls. For the two female NC patients complete bilateral loss of muscle tone was very disturbing, in one patient it was the leading symptom. The male patient reported orgasmolepsy only when in a relationship involving emotional commitment and trust. One female NC patient reported no more orgasmolepsy under treatment with sodium oxybate. In the patient with BIISS and orgasmolepsy, cataplexy-like symptoms affected one or the other upper or lower limb usually triggered by negative emotions and sports activities.

Conclusion: We suggest that orgasmolepsy is a distinct feature in NC patients but cataplexy-like symptoms may occur in other sleep disorders. EDS may represent a gating mechanism in orgasmolepsy and cataplexy-like symptoms.

P 36 HHV-6 variant A encephalomyelitis

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Background: Human herpes virus type 6 (HHV-6) is expressed as two variants, A and B. Whereas HHV-6B causes roseola in childhood, HHV-6A has not been associated with a clearly defined syndrome yet, although isolated reports describe a specific neurotropism especially in immunocompromised patients.

Objective: To describe a case of encephalomyelitis associated with the variant A of HHV-6 in an immunocompetent patient.

Patient: A 59-year-old previously healthy woman exhibited clinical and radiological evidence of encephalomyelitis involving the cerebellum and the spinal cord. Treatment with ganciclovir allowed full clinical recovery and disappearance of magnetic resonance imaging (MRI) lesions.

Results: HHV-6A DNA was detected in the serum by real time PCR. Infection with this virus was confirmed by the presence of IgM antibodies. PCR for other viruses, in particular for other herpes viruses, was negative. Ganciclovir therapy was correlated with a dramatic decrease of HHV-6 virus load.

Conclusions: This case supports the previously suspected neurotropism of HHV-6A and demonstrates a reversible, multifocal CNS involvement of HHV-6A acute infection in an immunocompetent adult. Identification of HHV-6 infection has therapeutic implications since these patients seem to better respond to ganciclovir rather than acyclovir, the most commonly used agent for herpes simplex type-1 and -2 infections.

P 37 Interferon b-1a treatment for multifocal motor neuropathy responsive to IVIg: a prospective pilot trial

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Objective: IVIg is the only established therapy for multifocal motor neuropathy (MMN). We conducted a small pilot trial with INF b-1a and assessed the effect on the IVIg dose requirement in patients whose MMN was responsive to IVIg.

Patients and methods: 3 patients were enrolled when they had been receiving IVIg infusion every 2nd to 6th week prior to study entry. The study was a prospective, 9-month pilot trial. INF b-1a was administered 3 times a week subcutaneously with at a full dose of 12 MIU while IVIg therapy was maintained. We hypothesised that the addition of INF b-1a would result in a lowering of the mean dose/month of IVIg, an improvement of disability and quality of life, an improvement of strength and a reduction of the treatment costs.

Results: We observed that the intervals of IVIg treatment were prolonged during the combination therapy from 6 to 8 weeks in one patient and from 5 to 6 weeks in another one. These 2 patients observed also a quicker recovery after the IVIg treatment in combination with INF b-1a and a slower relapse before the next IVIg treatment. The third patient had no change. We did not observe major changes in the strength, disability, quality of life or a reduction of the costs. There were no adverse events.

Conclusions: A combination therapy could improve the evolution of MMN. We need larger studies to confirm if the addition of INF b-1a to IVIg results in a better management of this disease.

P 38 First Val30Met transthyretin mutation in a Swiss patient: a case of familial amyloid polyneuropathy

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Background: We present a case of late-onset progressive polyneuropathy caused by an amyloidogenic variant of transthyretin (TTR) in a Swiss patient. This Val30Met mutation causes progressive systemic amyloidosis which, left untreated, usually leads to death within 10 years after the first symptoms.

Case report: Our 60-year-old male patient initially presented with limb paraesthesia, pain, ataxia and erectile dysfunction. Electroneurography at that time had shown signs of axonal loss and demyelination. CSF protein was elevated. A diagnosis of CIDP was made and the patient was treated with 70 mg of prednisone daily. Nevertheless the disease progressed, with the patient developing cardiac involvement, bladder and bowel dysfunction and weight loss of over 20 kg. At present he is fully dependent because of plegic distal arm and leg muscles. Nerve biopsy showed amyloid deposits which stained positive for transthyretin. Genetic analysis demonstrated a Val30Met mutation in the TTR gene.

Conclusion: To our knowledge this is the first case of Val30Met mutation in a patient of Swiss origin. The Val30Met mutation is common in Portuguese, Swedish and Japanese families. No family history is known in our patient but further family studies will show whether this might be a spontaneous mutation. In cases of progressive neuropathy with autonomic dysfunction nerve biopsy and genetic analysis for familial amyloid neuropathy by sequencing of the TTR gene are warranted despite negative family history.

P 39 Sickle-cell disease in Cameroon: the cause of severe cognitive impairment in school-aged children

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Background: In Yaounde, the capital of Cameroon, about 40 000 to 60 000 people suffer from sickle-cell disease (SCD). About 5–10% of the SCD will have a cerebrovascular accident (CVA) before the age of 20. Infarctions may sometimes be difficult to detect with a standard neurological examination, the so-called 'silent infarcts'. A detailed neuropsychological testing, however, can permit some cognitive deficits to be revealed and then motivate the initiation of treatment.

Objectives: The objective of this study was to implement neuropsychological testing as additional aid in detecting and preventing stroke among Cameroonian school-aged children suffering from SCD.

Results: Preliminary results show that the cognitive deficits are extremely severe among this sample population (n = 117): only 33% of the patients have a normal neuropsychological examination, while 34% have mild cognitive deficits and 32% have severe cognitive deficits. This prevalence rate of cognitive deficits is much higher than that observed in similar studies in Western countries (Schatz et al., 2001; Kral et al., 2003; White et al., 2006). These results, obtained for the first time in Cameroon, suggest that sickle-cell disease has a greater negative impact on cognitive function in Cameroonian patients than those in other countries.

P 40 NESC: a new quantitative and qualitative screening for dementia

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The many established diagnostic screening tools for dementia are purely quantitative. We present first results on the "neuropsychological screening for dementia" (NESC), a new assessment tool for non-specialists, emphasising both qualitative and quantitative aspects of neuropsychological symptoms and their classification. 43 participants (mean age 78 years, range 59–94, 25 women) were assessed with the NESC and the mini mental status (MMS). Subjects were classified by a neurologist blind to the scores into a demented and a non-demented group. We analysed the NESC total score as well as the subscores consisting of orientation, behavioural symptoms, learning and memory, visual-constructive ability, language, cognitive flexibility and motor symptoms. We found a high correlation between the NESC and the MMS ($r = -0.835$, $p < 0.001$). The sensitivity (90.9%) and specificity (90.5%) for the presence or absence of dementia of the NESC are high (ROC d': 0.963), the preliminary determined cut-off being at 9 points (max. 55, 0 = non-demented). The weighted subscale values allowed a further classification of dementia into cortical, subcortical, mixed forms and MCI (mild cognitive impairment). This analysis supports diagnosis in cases with mental dysfunctions.

Conclusion: The NESC is a valuable tool for practitioners confronted with patients presenting with cognitive dysfunctions.

P 41 A progressive carvenous sinus syndrome with orbital apex and secondary cerebral extension due to a zygomycosis

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Rhinocerebral mucormycosis is a rare devastating fungal infection mainly seen in immunologically or metabolically compromised patients (with a 80% mortality rate according to the literature). We describe the case of a 40-year-old patient with ignored diabetes who was admitted for a right cavernous sinus syndrome following ipsilateral maxillary dental extraction. The patient was a former drug addict and has been known for a chronic hepatitis C infection. A diabetic decompensation was discovered at admission. Neurological examination and MRI confirmed a cavernous sinus lesion with partial venous thrombosis and orbital apex extension. A first ENT surgery was done and pathological examinations revealed the presence of a zygomycosis caused by a rhizopus. The patient was treated with liposomal amphotericin B, posaconazole and extensive surgical debridement including right exenteration but it did not prevent an intracranial extension into the adjacent temporal lobe neither an internal carotid extension with subsequent arteritis.

This rare case reminds us that opportunistic fungal infection should not be excluded in diabetic patients and that aggressive medical and surgical treatment must be initiated as soon as possible in order to prevent a fatal outcome.

P 42 Motor learning, response-time and fatigue in Parkinson's disease (PD)

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It has been shown that PD patients have deficits in motor learning in addition to clinical symptoms.

Our aim was to determine the relationship between PD symptoms and visuomotor learning, response time and motor fatigue.

Eleven healthy subjects and 24 treated PD patients (symptoms quantified with UPDRS III) performed a visuomotor learning task. They had to respond as fast as possible with key presses to visual stimuli appearing in random order.

Although there was a tendency for PD patients to respond slower ($p = 0.067$), visuomotor learning occurred to an equal extent in patients and healthy subjects. In addition, individual response time had no effect on visuomotor learning or fatigue, neither in patients nor in healthy subjects. However, in patients bradykinesia ($rs = 0.83$, $p < 0.001$) and Hoehn & Yahr stage ($rs = 0.42$, $p < 0.05$), but not tremor or rigidity, correlated with a lower response time. Only rigidity was weakly associated with visuomotor learning ($rs = -0.41$, $p = 0.05$) and only Hoehn & Yahr correlated with fatigue ($rs = 0.43$, $p < 0.05$).

We conclude that there is no significant difference in response time, fatigue and visuomotor learning between treated PD patients and healthy subjects. Treated PD patients as well as healthy subjects are able to learn a visuomotor task and this ability does not depend on the individual response time. Severity of PD symptoms correlates with increased response time, slightly increased fatigue and slightly reduced motor learning.

P 43 Posterior reversible encephalopathy as the initial manifestation of a Guillain-Barré syndrome

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We report on a patient with a posterior reversible encephalopathy syndrome (PRES) as the initial manifestation of a Guillain-Barré syndrome (GBS). PRES is a consequence of a breakdown of circulatory autoregulation caused by acute hypertension. There are only few cases describing PRES as an initial manifestation of GBS.

A 57-year-old female patient had headache, paraesthesias of the fingers and feet. Examination revealed hypertension and tachypnoea. CCT was normal. The brain MRI showed a bioccipital vasogenic oedema consistent with PRES. Consecutive examination showed decreased sensibility of the extremities and trunk, tetraparesis with areflexia and gait ataxia. Cerebrospinal fluid analyses revealed albuminocytologic dissociation. Electrophysiology showed demyelinating polyneuropathy and the diagnosis of GBS was made. Intravenous immunoglobulin (IVIg) therapy was initiated. Later the patient developed transient cortical blindness after a Valsalva's manoeuvre. Brain MRI showed no new lesions. Two weeks after IVIg the patient had an amelioration of all symptoms.

The typical features of PRES were present prior to the clinical manifestation of GBS. In the literature only few cases of PRES in combination with GBS have been described. The transitory cortical blindness is probably caused by a critical perfusion of the marred occipital tissue during the Valsalva's manoeuvre. We suspect GBS as an independent risk factor for PRES.

P 44 Orofacial primary headache syndromes

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Background: Primary Headache syndromes like migraine and cluster headache are described, according to International Headache Society criteria (ICHD-II [1]), with pain in frontotemporal, orbital or supraorbital regions. Patients with "atypical dental pain" with features otherwise reminiscent of pri-

mary headache syndromes presented to our clinics or emergency units, some of them with a history of dental procedures without benefit.

Cases: We describe patients with pain manifestations in the second and/or third division of the trigeminal nerve, but otherwise fulfilling ICHD-II criteria, for migraine (two patients [2]) and cluster headache (two patients [3]). Interestingly, all responded to pharmacotherapy targeted at the suspected underlying primary headache syndrome.

Conclusions: Our patients suggest that otherwise typical primary headache syndromes can present with a pain localisation in the 2nd and 3rd rather than the 1st division of the trigeminal nerve. This can be explained by the neuroanatomical convergence of trigeminal with cervical afferents in the nucleus caudalis. These patients need to be recognised, also in the dental context, as the appropriate treatment seems to be pharmacological rather than dental.

References

1 International Classification of Headache Disorders. 2nd edition. 2004.

2 Gaul et al. Orofacial migraine. Cephalalgia 2007.

3 Gaul et al. Orofacial cluster headache. Cephalalgia 2008 (in press).

P 45 Unconscious influences of previous experience and neural correlates in decision making under uncertainty

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In the Trust Game (TG), the amount of money that Player 1 invests is tripled and given to Player 2, who in turn can give back to P1 the amount of his choice. In our version of the TG, P1 indicates how much money he is expecting in return, leading to four possible outcomes (extreme positive/negative or neutral positive/negative). This study aims to investigate neural correlates linked to the emotions elicited by different outcomes using behavioural data and EEG from 12 healthy volunteers. Subjects reported conscious knowledge of the independency of the trials since playing with different opponents. Behavioural results show that after strong disappointment none of them invested more in the actual trial than in the previous one. This proves that disappointment elicits unconscious mechanisms that influence rational decision making. Electrophysiological results at fronto-central electrodes showed a Feedback Related Negativity (FRN) appearing at 250 ms after feedback with larger amplitude for the positive outcome. A significant modulation by mismatches in outcome expectation was observed for a positive component appearing around 350 ms, with similar topography. ELECTRA source localisation revealed sources at anterior cingulate cortex / medial prefrontal cortex for the FRN and at hippocampus and parahippocampal region for the positive component. Interestingly, the N170 component showed significant differences between positive and negative outcomes.

P 46 Retinopathy as a possible side effect in the subcutaneous treatment with interferon-beta

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A 44-year-old female, diagnosed with relapsing remitting MS, started a disease-modifying therapy (DMT) with interferon-beta 1a (Rebif® 44 µg/3 times weekly) in 08/06. One and a half month later, the patient claimed decreased visual function on both eyes. An ophthalmologic examination showed few retinal cotton-wool spots which rapidly increased until 11/06. As no other explanation for the retinopathy was found, a casual relationship between the DMT and the retinopathy was suspected and Rebif® was stopped. One and a half month later, a complete remission of the cotton-wool spots was observed. Another DMT, this time interferon-beta 1b (Betaferon®), was begun in 02/07. One month later, the ophthalmologic control showed no signs of retinopathy at all. Shortly after this examination, the patient complained of the same visual symptoms as during Rebif® therapy. Again severe bilateral retinopathy with cotton-wool spots was found and the DMT was stopped. During follow-up a slow improvement of the retinopathy was observed.

Retinopathy secondary to treatment with interferon is well known in the treatment with interferon-alpha. Despite being a frequently occurring complication, it is usually a mild condition and disappears when withdrawing the treatment, or even if therapy is continued. Only few cases associated with the treatment with interferon-beta have been reported in the literature so far. We recommend thinking of this possible side effect when treating MS patients with interferon-beta.

P 47 Does analysis of cerebral microbleeds and ApoE genotyping help diagnose cerebral amyloid angiopathy in patients with non-traumatic intracerebral haematoma?

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Background: Arterial hypertension (aHT) is the most frequent disease causing non-traumatic intracerebral haematoma (ICH), accounting for 75% of the cases. In 80% of the cases, haemorrhage is located in the deep region (basal ganglia) and in 20% haemorrhage may also occur in the lobar cortical areas. In this context, cerebral amyloid angiopathy (CAA) is often evoked. CAA is responsible for 12% of all non-traumatic ICH. The study of cerebral microbleeds (CMBs) on SWI T_2*-weighted images on MR and their location cannot by itself conclude on any pathology. Genotyping ApoE helps; ApoE 4- and 2-carriers have been related to CAA while ApoE 3 is being more protective.

Objectives: Distribution of haematoma and CMBs (according to a classification of cortico-subcortical (CSC) areas vs deeper areas), prior stroke, hypertensive status and ApoE genotyping would give more accuracy in diagnosis and following treatment.

Methods: Typical aHT and CAA patients based on MR imaging have been selected and we realised a complete aHT evaluation and ApoE genotyping. We evoked trends for diagnosis based on MR finding, aHT evaluation and patient history.

Results: Out of 9 patients, 7 had a trend for CAA and 2 for aHT lesions. Genotyping of ApoE was congruent with our trends in 6/7 cases of CAA and 2/2 for aHT, based on the presence of ApoE 4 or 2 and absence of ApoE 3 for CAA.

Conclusion: Our preliminary results showing a correlation between haematoma/CMBs location and ApoE status incite us to pursuit our study.

P 48 Anosognosia: a prospective study

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Anosognosia is defined as a lack of awareness of a neurological deficit (e.g. hemiplegia) due to focal brain damage. We prospectively screened a population of 337 patients with an acute right hemispheric stroke, among whom 58 cases showed significant motor deficit of the left hemibody. Anosognosia was present in 32% of these patients during the hyperacute phase (up to 3 days after stroke). This frequency is much higher than previous reports in the literature (10 to 18% according to Baier and Karnath, 2005) and likely to reflect the precocity of our evaluation. Indeed, follow-up testing showed that the frequency of anosognosia was reduced to 18% one week later and to 5% after six months. In terms of clinical characteristics, anosognosia was correlated with the presence of severe sensorimotor deficits, hemianopsia, neglect, impaired vigilance, spatio-temporal disorientation and overestimation of self-performance in motor tasks, though none of these deficits was uniquely associated with anosognosia. Taken together, our data indicate that anosognosia is a major but transitory and hyper-

acute manifestation of stroke, highlighting the importance to study it as early as possible to understand the underlying neuropsychological mechanisms. The frequent dissociations with other clinical symptoms point to the complexity of the phenomenology of this deficit and multiple causal factors.

P 49 Early metabolic responses in temozolomide-treated low-grade glioma patients

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Objective: Chemotherapy represents a treatment option in low-grade gliomas (LGG) not amenable to tumour resection. Due to their slow growth treatment responses may be detected with a delay of several months by magnetic resonance imaging (MR). As amino acid transport and protein synthesis are early steps of tumour growth, we investigated metabolic responses to temozolomide (TMZ) chemotherapy using positron emission tomography (PET) with the amino acid F-18 fluoro-ethyltyrosin (FET).

Methods: 11 LGG patients were prospectively selected for low-dose continuous TMZ. Imaging follow-up studies were done at 6-month intervals, initially starting 6 and in a second series 3 months after initiation of TMZ. FET uptake was quantified as tumour: cerebellum ratio and as active tumour volume (pixel volume >110% of the cerebellar activity). PET data were compared with the tumour volume obtained on MR FLAIR sequences.

Results: Eight patients showed metabolic responses. Already at 3 months the active FET volumes declined to 38% from baseline. Small MR volume responses were noted at 6 months in 4 patients. A maximal response with FET was reached between 6 and 12, and with MR between 12 and 24 months.

Interpretation: Deactivation of amino acid transport and tumour blood flow are early indicators of successful chemotherapy. Our findings suggest that response criteria in LGG have to be refined. The time window obtained from molecular imaging may assist for individual treatment decisions in LGG patients.

P 50 Retrospective analysis of mitoxantrone treatment in patients with multiple sclerosis

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Introduction: Mitoxantrone is a cytostatic antibiotic with immunosuppressive and -modulatory characteristics and is actually part of the escalatory treatment regimen in multiple sclerosis.

Methods: All patients (66) treated with mitoxantrone between 7/2000 and 6/2007 at the Department of Neurology in Aarau were studied in a longitudinal fashion including the course of the disease prior to the start of mitoxantrone. The main questions that could be addressed were (a) the development of the individual EDSS under mitoxantrone compared to the prior therapy period, (b) the influence on the individual number of relapses and (c) the frequency of serious side effects.

Results: On average, irrespective of the type of the disease course, the EDSS was slightly reduced during the mitoxantrone treatment by –0.05 (treatment on average 1.4 years). The treatment period before mitoxantrone showed an EDSS developing from 3.2 to 5.0 (over 5.2 years on average; + 0.32/a).

The number of relapses was dependent on the type of disease course. The number of relapses varied from 1.72 / a in the pre-mitoxantrone period and was reduced to 0.26/a during mitoxantrone therapy.

The side effects of mitoxantrone generally were negligible. 27/66 patients showed no side effect at all.

In 15/66 the therapy had to be discontinued because of a variety of reasons.

Discussion: The results support the notion that mitoxantrone dramatically changes the individual course of the disease.

P 51 The impact of minor trauma on the outcome of thrombolysis in stroke patients

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Trauma and surgery within the last three months may be a reason for exclusion of patients from thrombolytic treatment in the acute stage of a stroke. It arises, however, the question whether conditions reflecting a minor trauma can be sufficiently defined and differentiated, allowing the performance of acute-stroke treatment without significant side effects for the patients. Therefore we analysed the data of 90 consecutive cases treated within two years by intravenous thrombolysis for ischaemic brain infarction in our stroke unit. Stroke-related trauma occurred from fall in 12 cases, in 3 cases with significant soft-tissue injuries. Additionally, one patient had arthroscopy of the knee and another lumbar disc surgery a few days before the acute event. After thrombolysis the local injuries deteriorated due to enlarged bleeding. However, the patients recovered well and their functional status, as expressed by the modified Rankin scale, was at the same level as in patients without an interfering trauma. Also, there were no local sequelae of the trauma.

Concluding, we observed an overall trauma rate, including surgery, of 15.5% in a cohort of 90 thrombolysed patients. In 4 cases (3.6%) the trauma was at an intermediate degree and, thus, at an arbitrary level to exclude patients from thrombolysis. The issue of trauma interfering with treatment should be carefully monitored in order to appropriately indicate thrombolysis.

P 52 Capacity of visual short-term memory across hemi-fields in neglect patients

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Recent findings in healthy subjects showed that memory capacity for spatial locations but not colours may increase when the items are separated between the two visual fields, rather than presented within the same hemi-field. This observation suggests some independence between the two fields for encoding spatial locations. We used a similar task to test patients with right hemispheric brain lesion with (n = 2) or without (n = 4) neglect syndrome. We compared performance in a colour or location change detection task, in which the items were displayed either in the two visual fields or in the same hemi-field. Stimuli were presented in two successive frames (300 ms each) in different hemi-fields (above or below of fixation) or in the same hemi-field (left or right of fixation). Preliminary results reveal that non-neglect and healthy control groups showed increases in memory capacity for spatial locations and colours when items were presented between the two visual fields, and decreases in capacity when stimuli were presented into the same visual hemi-field. The neglect group showed the same pattern in the colours' condition, whereas in the location condition, the neglect group showed no difference for between and within presentation (60% correct in each case). We conclude that working memory is reduced in neglect patients on tasks that involve attention to and maintenance of spatial location distributed across both hemi-fields, but not on tasks that involve non-spatial identity information.

P 53 Multiple sclerosis relapse enunciated by a transient ischaemic attack-like symptomatology

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According to its definition, neurological symptoms should last at least 24 hours to be considered as a relapse. Although sudden onset has been described, sudden offsets are very unusual. We herewith report a 25-year-old woman treated for 6 years with beta interferon for relapsing remitting multiple sclerosis (RRMS).

She was admitted for an acute left hemiparesis which occurred at work, lasted for 1 hour and offset completely within a few minutes that were highly suggestive of a transient ischaemic attack (TIA). Vascular risk factors were smoking and contraceptive pill. Neurological and paraclinical examinations including neurovascular ultrasound, coagulation tests and Holter-ECG were normal. Patent foramen ovale was absent. Brain MRI performed within 12 hours of symptom onset showed an acute DWI-hyperintense, reduced ADC, contrast-enhanced lesion in the right internal capsule which correlated with the clinical picture. Despite a complete clinical recovery she received Aspirin and IV steroids for 5 days. Surprisingly, 3 days later, she developed an identical but progressive left-sided hemiparesis which lasted for 3 weeks.

This case illustrates a very atypical presentation of MS relapse enunciated by a TIA-like symptomatology. Localisation in the internal capsule is unusual for MS relapse and may explain this clinical presentation. In addition, MRI signal reduced in ADC sequences has been described as an early event in the development of a demyelinating plaque.

P 54 Validation of a one-dimensional model of the arterial cerebral circulation

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Blood flow phenomena play an important role in cerebrovascular disease. The wall shear stress acting on the endothelial cells is linked to growth and possible rupture of the aneurysm wall and seems to play an important role in atherogenesis and the stability of plaques in the carotid bifurcation. Clinical assessment of haemodynamical forces within the cerebral circulation is still difficult because pressure can be measured only invasively and flow, especially in small deep intracranial vessels, cannot be measured directly. This renders the modelling of blood flow within the cerebral circulation an attractive alternative.

The one-dimensional form of the fluid equations was applied over each arterial segment. A non-linear viscoelastic constitutive law for the arterial wall was considered. The arterial tree dimensions and properties were taken from the literature and completed with real patient scans and coupled to a heart model. To validate model predictions, we performed non-invasive measurements of pressure and flow waves in young volunteers. Pressure was measured with tonometry and cerebral blood flow velocities with transcranial ultrasound and gated phase contrast MRI.

The model predicts pressure and flow waves which are in good qualitative agreement with in-vivo measurements. The results obtained here allow us to that model prediction of pressure and flow in central arteries as well as in major arteries of the brain, validating thus the general applicability of the model.

P 55 Transforaminal Doppler: an alternative to transtemporal approach in the detection and quantification of patent foramen ovale

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Paradoxical thrombotic embolism via right-to-left cardiac shunt (RLS) is a risk factor for ischaemic stroke. Transtemporal Doppler (TTD) shows a high sensibility and specificity in the detection of patent foramen ovale (PFO) when compared to transoesophageal echocardiography. Even younger patients may not have a sufficient temporal bone window. We thus studied prospectively whether a transforaminal (TFD) approach is an alternative to TTD in the detection and quantification of RLS due to PFO.

64 patients (33 women; mean age: 49.5 years) subsequent to a recent stroke of unexplained origin underwent TTD (middle cerebral artery) and TFD (basilar artery). Artificial high-intensity signals (HITS) produced by a 1 ml/air-9 ml/saline injection at rest and after efficient Valsalva's manoeuvre were measured by the sonographers blinded to the results of TEE. The two methods were compared in terms of number of HITS. For more than 60 HITS or "curtain effect" the number 60 was given.

TTD and TFD had a 100% agreement as to absence of HITS (22 patients) and "curtain effect" (>60 HITS; 15 patients). Pearson correlation between the number of HITS of the two methods was highly significant ($r = 0.976$; $t\,[df\ 37] = 27.096$; $p < 0.000$). Even when discarding patients with no-HITS and those with "curtain effect" >60 HITS, the correlation remained highly significant ($r = 0.870$; $t\,[df\ 13] = 6.611$; $p < 0.0002$).

TFD seems to be a valid alternative in the detection and grading of RLS in patients with poor temporal bone window.

P 56 Emotional motor control in narcolepsy-cataplexy

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Background: The most specific symptom of narcolepsy-cataplexy (NC) is cataplexy, a sudden loss of postural muscle tone triggered by intense emotions. Emotional triggers of cataplexy suggest the possibility of an abnormal emotional motor control in these patients.

Objectives: To test the effect of emotions on voluntary motor control in NC, an emotional version of a stop-signal task was used. This task provides the possibility to dissect inhibitory motor control from motor execution and other unspecific cognitive functions, in particular from speed of reaction time (RT).

Methods: Five drug-free, HLA-DQB1-*0602 positive NC patients and three controls performed an emotional version of stop-signal task. RT to "go" stimuli and the latencies needed to stop a motor response (SSRT = stop signal reaction time) were measured under different emotional conditions (neutral and fearful stimuli).

Results: RT to "go" trials were slower in NC than in controls regardless of emotional valence (neutral and fearful, $p = 0.01$, respectively). SSRT to neutral stimuli in NC were faster compared to controls ($p = 0.03$) whereas SSRT to fearful stimuli did not differ significantly ($p = 0.15$).

Conclusions: Although NC patients are slower than controls in response to emotional stimuli, their inhibitory motor control appears to be functional. Remarkably, motor inhibition was affected by emotions in NC but not in controls. These preliminary results suggest a different emotional influence on motor inhibition in NC.

P 57 Emotional and reward processing during game playing in narcoleptic patients: a functional MRI study

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Background: Narcolepsy with cataplexy (NC) is characterised by excessive daytime sleepiness and cataplexy, caused by hypocretin (HCRT) deficiency. Although NC patients often report cataplexy episodes when playing games, it is unknown whether hypocretin depletion in humans might selectively affect neural activity in reward systems.

Methods: We acquired event-related fMRI data on 12 NC patients and 12 matched controls while they performed an incentive delay task. On each trial, subjects were presented with a cue displaying the amount to be won/lost, followed by a target. Subjects pressed on a key as quickly as possible during target presentation. Immediate feedback notified current gain.

Results: Regions involved in reward processing (ventral striatum, cingulate), motor preparation and visual attention were more activated for larger cues in both groups. However, ventral midbrain, including the VTA, was modulated by the size of the cue presentation in controls but not in NC patients. Prefrontal cortex and nucleus accumbens were more activated during winning compared to losing in the controls only. Importantly, NC patients showed increased amygdala response selectively to large positive reward.

Conclusion: Our fMRI findings provide evidence for altered limbic-striatal responses in hypocretin-deficient patients during reward processing.

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P 58 Differentiating epileptogenic and eloquent cortex with electric source imaging despite large brain lesions

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We evaluate the reliability of high-resolution electric source imaging (ESI) in localising epileptogenic and eloquent sensorimotor cortex in patients with therapy refractory focal epilepsy with brain lesions where conductivity inhomogeneity can interfere with the precision of focus localisation. We recorded spontaneous 256 EEG (containing numerous spikes) and during median nerve electrical stimulation in patients with partial epilepsy and brain lesions. We averaged spike and somatosensory evoked responses (SSEP) epochs. The ESI analysis was based on a realistic head model using each patient's MRI and a distributed linear inverse solution. Results were compared to fMRI of sensorimotor cortex and EEG-triggered fMRI of the interictal epileptic activity. Comparison with intracranial recordings was done when available. Our results indicate that even in the presence of extended brain lesions 256-channel ESI correctly and precisely identified the epileptogenic zone as well as the somatosensory cortex. This was confirmed by concordant results of the other localisation techniques. Differences were seen when fast propagation of epileptic activity hampered unambiguous identification of one single focus in fMRI. ESI of the focus and eloquent cortical areas is a non-invasive tool allowing reliable identification of pathological and functional relevant brain areas in the presurgical evaluation. It may provide decisive information during the presurgical decision-making process.

P 59 Anti-epileptic drugs in the management of status epilepticus: the Geneva experience

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Background: Status epilepticus (SE) causes major physical compromise, but management is still debated, especially in case of benzodiazepine (BZD) refractory SE.

Methods: Between 2001 and 2007, we retrospectively identified 48 adults (30 men) who were admitted with clinical diagnosis of SE, confirmed with EEG. We compared the treatment management and outcome. Administered drugs were BZD, phenytoin (PHT), valproate (VAL), diprivone, pentothal and isoflurane. Outcome at final follow-up was divided into two groups (1 = alive, 2 = deceased), with a subgroup of patients needing intensive rehabilitation. Cause of SE and drugs' side effects were also studied.

Results: 29 patients (60%) survived (7 rehabilitations) and we lost one patient for follow-up. SE was successfully treated with BZD in 13/14 cases, PHT 5/5 and VAL 5/8 respectively, diprivone in 9/15 cases and another anaesthetic drug in 2/5 patients. The efficacy across all drugs was significant ($p < 0.01$). If only VAL and PHT are considered, there is a strong trend in favour of PHT ($p = 0.05$).

Conclusion: BZD remains the first line treatment for SE and is often efficient. Further rigorous prospective studies are needed to determine the best molecule (PHT or VAL) in order to define guidelines in case of BZD-refractory SE.

P 60 A method to measure the distribution of central motor conduction times in man

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Objective: To establish a method for measuring the distribution of central motor conduction times (CMCTs) in man with transcranial magnetic stimulation (TMS).

Method: We used the triple stimulation technique (TST) to quantify the percentage of excited spinal motor neurons supplying M. abductor digiti minimi in response to a maximal magnetic brain stimulus (Magistris et al. 1998). By manipulations of the delays of the TST it was possible to quantify percentages of the pyramidal tract with a given CMCT.

Results: For all 23 healthy subjects and 5 multiple sclerosis (MS) patients our method allowed establishing CMCT distributions showing considerable interindividual variability. The shortest CMCT (CMCTmin) was 8.3 ms (SD 1.4 ms) on average. In most subjects CMCTs were bimodally distributed, with a first peak around CMCTmin + 2 ms representing 68% (SD 25%) of excited upper motor neurons on average, and a second peak around CMCTmin + 9 ms. No specific differences were found in the 5 MS patients.

Discussion: The bimodal distribution of CMCTs suggests a fast and a slow subgroup of pyramidal tract fibres in man, as previously described in animal studies. The presented collision technique will allow further assessment of slower conducting central motor fibre portions in diseases such as multiple sclerosis.

P 61 Supramaximal excitation of the brachial plexus by percutaneous monopolar stimulation

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Objective: To demonstrate that percutaneous monopolar stimulation of the brachial plexus at Erb's point allows supramaximal excitation of the brachial plexus without provoking adverse effects.

Methods: We retrospectively analysed brachial plexus stimulation data from 1105 consecutive examinations. Monopolar plexus stimuli were applied as previously described (Roth and Magistris, 1987) using a small cathode electrode (diameter 3 cm) taped over Erb's point and a large remote anode electrode (surface area 32 cm^2) taped over the internal region of the suprascapular fossa. Compound muscle action potentials (CMAPs) were recorded from the abductor digiti minimi, the abductor pollicis brevis or the first dorsal interosseus. We compared the size of CMAPs after plexus stimulation to that after wrist stimulation.

Results: CMAP areas to Erb stimulation were on average almost as large as to wrist stimulation (CMAPErb/CMAPWrist = 0.96 ± 0.199). Area ratios <0.8 were found in 63 examinations (3.5%); and area ratios <0.7 were found in 39 examinations (3.5%). Of the 39 examinations with area ratios <0.7, 11 were done in patients affected by peripheral nerve disorders (chronic inflammatory demyelinating polyneuropathy in 6 examinations), who showed weakness of the examined limb in 6 examinations. No adverse effects occurred.

Conclusion: Monopolar stimulation at Erb's point is safe and allows supramaximal excitation of the brachial plexus in most subjects.

P 62 Role of the amygdala in the control of saccadic eye movements

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Amygdala dysfunction likely contributes to the deficits in social cognition seen in autism and schizophrenia. Abnormal visual scanning also accompanies these pathologies which might suggest a role for the amygdala in gaze control. To investigate this issue, we recorded local field potentials from amygdaloid nuclei while monkeys performed a learned saccade task. Specific saccade-related potentials were observed for visually evoked and spontaneous saccades. Both were characterised by strongly significant gamma band phase locking preceding saccade onset. These results provide the first electrophysiological evidence of the amygdala's involvement in saccade control. These findings support a widespread role for the amygdala in directing an organism's attention and provide a potential link between clinical findings of aberrant visual scanning in diverse pathologies and amygdala dysfunction.

P 63 A high performance brain computer interface based on visual attention

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Brain computer interface (BCI) systems aim at establishing a direct communication channel from the brain to an output device. It has been suggested that implanted electrodes and/or (motor) imagination are the most efficient and natural ways for their implementation. However, serious doubts about the possibility to predict hand position based on neuronal or scalp activity have been presented recently [1]. It has also been publicly demonstrated that BCI based on imagination does not always work [2]. On this poster we present the Geneva-BCI based on EEG and visual attention to external stimulus that can send commands every 0.5 (or 0.25) second and with the following theoretical properties. Results for two classes: maximum (100%) correct classification (CC) and maximum (120 bits/min) bit rate. Simple training in one single session. Similar results (99% CC) are obtained using classifiers computed from another session. Results for three classes: Very high (98.88%) correct classification and optimal (178 bits/min) bit rate. In practice the 2 classes BCI can control a robot simulator of 3 classes for a real bit rate of at least 107.7 bits/min. Using the theoretical 3 class model, we control a real robot with 4 commands, sending orders every 0.5 second via internet to explore a foreign lab several miles away.

References

1 Accurate hand trajectory prediction by real and synthetic EEG (see [2] for a preprint).

2 http://www.electrical-neuroimaging.ch/download.html.

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P 64 EEG-pattern of HHV6 encephalitis: a new differential of PLEDs

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Background: Recently, limbic encephalitis in patients after haematopoetic stem-cell transplantation (HSCT) has been attributed to infection with human-herpes-virus 6 (HHV6). To highlight this important differential diagnosis we report two patients diagnosed with HHV6 encephalitis after HSCT with emphasis on EEG-features and provide a review of the literature.

Result: Both patients (patient 1: mantle cell lymphoma, patient 2: common B ALL) developed acute GvHD 8 and 5 days after allogeneic HSCT and presented with acute short-term memory difficulties and confusion after 23 and 28 days. Both had mild hyponatraemia. EEG showed PLEDs (periodic lateralised epileptiform discharges) in both patients, one progressed to a refractory nonconvulsive status epilepticus. MRI displayed hyperintense signal in the hippocampal area, CSF-PCR was positive for HHV6. On autopsy, hippocampi showed massive neuronal loss and activated astrocytes compatible with HHV6 infection. In the literature EEG-features of 30 cases are reported: PLEDs in 5, diffuse or focal slowing in 21 and epileptic activity in 11 cases.

Conclusion: HHV6 encephalitis is a rare, potentially severe complication after HSCT. EEG is a helpful diagnostic tool. PLEDs are a prominent EEG feature, often attributed to herpes-simplex-virus 1 (HSV1) encephalitis. Whereas HSV1 is susceptible to acyclovir, HHV6 only responds to foscarnet or gancyclovir. Therefore, it is important to consider HHV6 encephalitis in HSCT patients showing PLEDs on EEG.

P 65 Serotonin syndrome following methylene blue infusion: a rare complication of antidepressant therapy

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Case report: A 77-year-old woman underwent parathyroidectomy for adenoma. Her past medical history included a depression, treated by clomipramine. She received methylene-blue infusion (5 mg/kg) for parathyroid gland localisation before surgery. On awaking, she had GCS 7, mydriasis, rigidity, clonus, hyperreflexia, autonomic hyperactivity, hyperpyrexia (42.3 °C). Cerebral CT was normal. The EEG showed an areactive diffuse slowing with triphasic waves, as seen in toxico-metabolic encephalopathy. Electrolytes were normal, except the CK (1104 U/l). Hyperpyrexia and rigidity improved after dantrolene administration in 24 hours, but encephalopathy remained. Under supportive care, she fully recovered to her baseline mental status and her EEG normalised in 1 week.

Discussion: The differential diagnosis included methylene blue toxicity, malignant hyperthermia (MH) and serotonin syndrome (SS). MH seemed less likely due to presence of mydriasis, hyperreflexia and clonus. Based on clinical presentation we diagnosed SS provoked by the interaction between methylene blue and the serotoninergic agent. 15 cases of encephalopathy following methylene-blue infusion have been described in the

literature, all in patients taking antidepressant medication.

Conclusion: Patients on serotoninergic medication are at high risk of developing severe neurological complication following methylene-blue infusion.

P 66 Ultrasound-guided sensory needle neurography of the sural nerve

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Introduction: In needle neurography the correct and reproducible positioning of the active electrode near the nerve is critical, because the amplitude of the sensory nerve compound action potential (SNAP) depends on the distance between needle and nerve. The aim of this study was to evaluate the usefulness of ultrasound to guide the needle positioning for sural nerve neurography.

Methods: Orthodromic sural nerve neurography was performed in 43 patients evaluated for possible polyneuropathy. Ultrasound-guided needle positioning (USNP) was compared to conventional "blind" needle positioning using anatomical landmarks (BNP), electrically guided needle positioning (EGNP) and to surface electrode sural neurography (SFN).

Results: The average amplitude of the SNAP was 19 μV (= 100%) with USNP, 15 μV (= 62%) with EGNP, 10 μV (= 52%) with BNP and 7 μV (= 32%) with SFN. The distance between nerve centre and needle was 1.1 mm with USNP, 3.6 mm with EGNP and 5.1 mm with BNP (all differences statistically significant).

Conclusion: Ultrasound increases the precision of needle positioning markedly, compared to conventional methods. Consequently the amplitude of the recorded SNAP is always clearly greater using USNP.

P 67 Cutaneous silent periods are not affected by the antihistaminic drug cetirizine

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Noxious digital nerve stimulation leads to transient suppression of EMG activity in isometrically contracted hand muscles, known as the "cutaneous silent period" (CSP). To date, potentially involved neurotransmitters mediating this inhibitory spinal reflex still remain unknown. Anecdotal communication leads to the assumption that histamine may be involved, as well-known CSPs in one male subject were temporarily lost following ingestion of an antihistaminic drug for acute rhinitis. A second otherwise healthy male subject, who was on antihistaminics (cetirizine) for allergic rhinitis, presented without clearly defined CSPs when volunteering for normal values. Therefore we studied CSPs serially in two female volunteers after they ingested 10 mg cetirizine (Zyrtec®, UCB, Brussels, Belgium). CSPs were elicited in thenar muscles following digit II and digit V stimulation before and 90, 180 and 360 min following medication. Both subjects, who were unaccustomed to the medication, became drowsy, but were able to complete the study without difficulty. CSPs remained unaltered throughout in both subjects. CSPs are not affected by cetirizine in therapeutic doses. Our findings do not confirm an association between loss of CSPs and antihistaminic medication. The cause for the loss of CSPs in the two anecdotal cases remains unclear, although an individual sensitivity to anticholinergic effects of the medication may have contributed and remains an alternative explanation.

P 68 Sensitivity and specificity of high-resolution multimodal evoked potentials in patients with multiple sclerosis

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We assessed the feasibility and utility of high-resolution somatosensory (SSEP) and visual evoked potential (VEP) mapping in the diagnosis of multiple sclerosis. In a standardised protocol we recorded median nerve SSEP and full-field pattern-reversal VEP from 256 equally spaced scalp electrodes. We established a normative database of 40 healthy subjects and developed an analysis method, based on the spatial distribution of the scalp electric field; which automatically and objectively determined latency, topography and strength of various cortical components. Using z-score statistics, we then evaluated the sensitivity and specificity of these different measures in patients presenting clinically isolated syndrome (CIS), in relapsing-remitting multiple sclerosis (RRMS) patients and in patients presenting other neurological diseases (OND), by comparing them to an age-matched control group. In comparison with the conventional evoked potentials analysis method, our approach seemed to identify more multiple sclerosis patients and less of the age-matched control subjects as abnormal, thus increasing its sensitivity and specificity. In addition, these multi-channel recordings were easy and fast, and therefore feasible in a clinical setting. We conclude that high-resolution multimodal evoked potential mapping could be a promising new tool in the early diagnosis of multiple sclerosis.

P 69 Vestibular neuritis: vertigo and the high-acceleration vestibulo-ocular reflex

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Patients after vestibular neuritis (VN) often report persistent dizziness and disequilibrium. We correlated persistent symptoms with sustained impairment of the high-acceleration horizontal vestibulo-ocular reflex as determined by quantitative search-coil head-impulse testing (qHIT). In 47 patients qHIT was recorded 0–60 months and symptoms assessed with the Yardley Vertigo Symptom Scale short form ≥18 months after VN onset. No correlation between the magnitude of high-acceleration vestibular impairment and the severity of vertigo symptoms was observed. The lack of symptom-qHIT correlation suggests that defective compensation at more rostral level in the central nervous system may be responsible for protracted symptoms in VN patients.

P 70 Electrophysiological assessment of central fatigue in multiple sclerosis

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Objective: To analyse the central motor conduction changes in relation to contraction force during muscle fatigue in multiple sclerosis (MS) patients compared to healthy subjects.

Methods: Measurements were done in 23 patients with definite MS and 13 healthy subjects, during 2 minutes of fatiguing exercise of the abductor digiti minimi muscle and the subsequent 7 minutes of recovery. Isometric contraction force was recorded by an electromechanical force transducer. Central motor output was quantified by transcranial magnetic stimulation using the triple stimulation protocol and calculating a central conduction index (CCI).

Results: Force declined gradually and consistently to approximately 40% of pre-exercise level at the end of the fatiguing exercise, both in healthy subjects and in patients. On average, the decline of CCI was significantly less marked in patients (–20%, SD 26%) than in healthy subjects (–57%, SD 12.9%). The decline of force and CCI were not correlated in either group.

Conclusions: During a fatiguing exercise central motor output decline is significantly less pronounced in multiple-sclerosis patients

than healthy subjects although the reduction of force is similar. These findings are compatible with the hypothesis that MS subjects can increase central drive during fatiguing exercise to a greater degree than controls, but this is associated with greater perceived exertion.

P 71 Yield of long-term EEG in patients with unclear paroxystic events

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Background: Long-term EEG (lEEG), i.e. ≥6 hours including sleep-time recording, is widely used for the diagnosis of unclear events which may or may not be of epileptic origin, if the standard EEG (stEEG) is unrevealing. Since lEEG is more expensive and time consuming than stEEG, we wanted to evaluate its utility in patients with paroxystic events suspect of unclear origin and determine the yield of lEEG.

Method: We retrospectively studied all patients that were admitted for lEEG between 2003 and 2007 and compared the initial diagnosis before and after lEEG. 165 patients were included (76 women). Mean age was 43 years, ranging from 1.5 until 93. We divided the diagnosis into six groups: epilepsy, psychogenic, cardiovascular, epilepsy plus psychogenic, others and unclear.

Results: Median evaluation period was 24 h (mean: 48 h). We found a significant difference ($p < 0.0001$) between initial and final diagnosis. Previously "unclear" cases received most often a diagnosis of epilepsy (25%), psychogenic (25%) or cardiovascular (21%) origin. Comparing 3 different age groups (children/adolescents, adults, elderly: age >65 years), a cardiovascular origin was found more often in the adult and elderly groups ($p = 0.02$).

Conclusion: lEEG has a high yield in refining the diagnosis. lEEG should therefore be performed fast when a doubt on the exact diagnosis exists in order to prevent costly and lengthy but incorrect therapies.

P 72 Conduction cortico-spinale et périphérique à destinée des muscles proximaux des membres inférieurs

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Le test combiné des quadriceps (TCQ) développé récemment, évalue la conduction centrale et périphérique à destinée des muscles proximaux des membres inférieurs. Il consiste en l'enregistrement par électrodes de surface des muscles vastes internes avec mesure des amplitudes et des latences des réponses M, des réponses réflexes T patellaires et des potentiels évoqués moteurs (PEM) par stimulation magnétique transcrânienne. Nous avons examiné 180 patients ayant une parésie proximale d'un ou des deux membres inférieurs d'origine cortico-spinale (n = 71), périphérique (n = 73) ou mixte (n = 36), comparé les résultats avec ceux de 100 contrôles et déterminé les sensibilités et spécificités des différents paramètres. Les meilleurs paramètres pour détecter un trouble moteur central sont les ratios d'amplitude et de latence T/PEM, le temps de conduction moteur central, le ratio d'amplitude PEM/M. Le temps de conduction moteur périphérique (TCMP) identifie le mieux les atteintes périphériques diffuses et le TCMPprox (TCMP-latence M) les atteintes périphériques proximales. L'amplitude M et le ratio d'amplitude T/PEM sont plus discriminatifs des atteintes périphériques distales. Le ratio d'amplitude T/PEM distingue hyperréflexie pathologique et réflexes vifs physiologiques.

Le TCQ est simple et bien toléré; il améliore l'évaluation de la conduction pour les muscles proximaux des membres inférieurs.

Schweizerische Gesellschaft für Neuropädiatrie SGNP

P 73 Neuroimaging in childhood arterial ischaemic stroke: evaluation of aetiologies and imaging modalities

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Introduction: We describe neuroimaging after arterial ischaemic stroke (AIS) and put it in relation to the classification by Ganesan (Dev Med Child Neurol. 2005;47:252–6).

Methods: From 95 children prospectively registered by the Swiss Neuropaediatric Stroke Registry from 2000 to 2006 neuroimaging was reevaluated in 80 patients by a neuroradiologist and a neuropaediatrician (blinded to the clinical findings). Available acute imaging (AI) (<14 days after stroke) was compared to follow-up imaging (FI) (>14 days after stroke).

Results: From 63 cases with infarction in medial cerebral artery (MCA) territory, lesion was cortical/subcortical (cs) in 25, with involvement of basal ganglia (BG) in 30, BG alone in 8 patients. Infarction within posterior cerebral artery (PCA) territory showed cs infarction in 7, cs and thalamus infarction in 9 and isolated thalamic lesion in only 3 children. CT was normal in AI in 5 children. Diffusion-weighted imaging (DWI) in AI (n = 44) was abnormal in all, but accompanying T_2-weighted images (T_2w) were normal in 4 cases. Acute MRA was abnormal in 37/47 patients (79%), evolution was evaluated in 22 follow-up MRA (4 days to 7 months).

Conclusion: Stroke pattern and volume was not clearly related to aetiology. DWI was best in early detection of lesion, CT and T_2w MR can be normal within the first day. Normalisation of acute MRA could be detected earliest within 4 days. Thus, MR imaging including DWI and MRA are best for investigation of children with AIS.

P 74 Symptomatic narcolepsy after encephalitis lethargica syndrome in a school-age child

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An encephalitis lethargica syndrome has recently been described in patients with basal ganglia autoimmunity. Symptomatic narcolepsy may develop following inflammatory brain diseases, and its idiopathic form is probably also linked to immune mediated mechanisms.

Case description: Two weeks after a transitory upper airways infection, a healthy 8-year-old boy developed hypersomnia, hyperphagia, apathy, irritability and night-sleep disturbances. He appeared hypomimic, with lips and tongue dyskinesia, dysarthria and head tremor. He never showed parkinsonism, cataplexia or sleep paralysis. CSF showed an undetectable level of orexine. Determination of HLA DQB1 0602 was positive. PSG showed an extremely fragmented night sleep with incomplete muscle atonia during REM; the patient had an apnoea-hypopnoea index just above the upper limit for his age (4/h, mostly hypopnoeas).The MSLT disclosed a shortened sleep latency (1 minute) with 4/4 SOREM. The patient improved under prednisone, administered for 5 months.

Conclusion: This child had secondary narcolepsy without cataplexy, symptomatic of an encephalitis lethargica syndrome triggered by a streptococcal infection. This observation may contribute to enlarge the spectrum of post-streptococcal neurological and neuropsychiatric disorders, and underlines the potential link between auto-immune mechanism and neural circuits involved in sleep regulation.

P 75 Myelopathy in a case of suspected Proteus syndrome

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Introduction: Proteus syndrome is characterised by gigantism with local overgrowth of tissues and secondary problems due to hypertrophy or tumours of variable tissues. Whether it is associated with mutations of the PTEN gene is controversial. We report the case of a 12-year-old girl who presented with progressive paraspasticity due to spinal cord compression.

Case report: The girl had a history of progressive large thoraco-dorsal hemangiolymphomatosis and lipoblastoma/lipoma. A Proteus syndrome had already been suspected. She presented with a subacute gait disorder due to paraspasticity as well as a sensory ataxia of both legs. She had a generalised gigantism with a pseudo-athletic habitus. Her face was dysmorphic. The MRI showed a plurisegmental vertebral dysplasia with a spinal stenosis Th 2–5, leading to compression of the myelon Th 3–5. There was also a scoliosis, an accompanying vertebral fusion Th 3/4 and a striking fatty degeneration of the M. erector trunci. The laminectomy Th 3–5 was complicated by respiratory problems. We suggest that this is a case of either Proteus syndrome or Proteus-like syndrome and we discuss clinical manifestations and complications.

Conclusion: The presence of disproportionate gigantism, dysmorphic facial features and progressively dysregulated adipose tissue and vascular malformations, complicated by megaspondylodysplasia and subacute myelopathy, suggests the diagnosis of Proteus syndrome or Proteus-like syndrome.

P 76 Retinopathy, progressive intracerebral calcification and epilepsy in a premature new-born: case report of a new entity

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Background: The most common cause of cerebral calcifications and retinopathy in infancy are intrauterine infections by toxoplasmosis, rubeola, CMV and herpes (TORCH). Calcifications can also be seen in tumoural, endocrine, metabolic and degenerative conditions (Aicardi-Gouttière, Cockayne syndromes). We present an infant with a severe retinopathy, first attributed to prematureness, and progressive cerebral calcifications who was finally diagnosed with a recently identified disease, cerebral retinal microangiopathy with calcifications and cysts (CRMCC, Crow et al., 2008).

Case report: This prematurely born (28 weeks) 18-month-old boy had a history of intrauterine growth retardation, intraventricular haemorrhage and severe bilateral retinopathy. Cerebral echography at 3 weeks revealed a few periventricular echogenicities. At 9 months, he was hypotonic with rowing eye movements and nystagmus. Head circumference was normal. Development was mildly delayed. At 11 months, he presented partial seizures, lethargy and irritability. Multiple intracerebral calcifications and hydrocephalus were seen on CT scan and a VP shunt was inserted. Cerebral MRI showed extensive bilateral cystic thalamic lesions with calcifications and diffuse white-matter abnormalities. CSF showed pleocytosis, elevated proteins and lactate. PCR in CSF and serologies for TORCH were negative. Serum lactate, calcium, phosphate, alpha-interferon (also in CSF) were normal.

Conclusion: CRMCC is a new multi-systemic disease entity of probably genetic origin which includes Coats' retinopathy and leucoencephalopathy with calcifications and cysts (Labrune et al., 1996). Very early onset has been described in only one case and represents a diagnostic challenge.

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P 77 Intra-thecal injection of mibefradil protects hippocampal neurons from delayed ischaemia-induced damage in a rat model of global ischaemia

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Ischaemia-induced neuronal damage remains a common cause of severe neurological disability and death. The earliest neuronal alterations observed in vivo are a small increase in basal intracellular calcium concentration. We made the assumption that reducing the initial calcium rise might increase neuronal tolerance to ischaemia. We found that low-voltage activated calcium channels (T-type Cav) had biophysical properties and an expression profile within the central nervous system that made them excellent candidates for sustaining the initial small calcium increase induced by ischaemia.

We observed that inhibition of T-type Cav during OGD with kurtoxin and mibefradil reduced delayed neuronal death in a dose-dependent manner correlating with current inhibition. T-type Cav inhibition not only reduced delayed neuronal death if applied during OGD but also if applied up to 3 hours after the insult.

A double-blind study, placebo vs intraventricular injection of mibefradil 6 hours prior to transient global brain ischaemia in rats, showed a significant reduction of delayed neuronal damage in vivo ($p < 0.0022$, $n = 30$). HPLC measurements of extracellular brain homogenate obtained from rats sacrificed 6 hours after injection showed mibefradil concentration in the inhibitory range (0.5 to 20 microM mibefradil). *In conclusion,* our results suggest that inhibition of T-type calcium channels during or even after induction of ischaemia might prevent ischaemia-delayed neuronal death.

P 78 Evaluation of the cerebrovascular pressure reactivity and optimal cerebral perfusion pressure in subarachnoid haemorrhage patients

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In head-injured patients cerebrovascular pressure reactivity (PRx) depends on cerebral perfusion pressure (CPP). The optimal CPP (CPPopt) is defined as the CPP at which PRx is lowest. The study investigates the association between vasospasm, PRx and CPPopt in poor-grade patients (WFNS 4 & 5) after subarachnoid haemorrhage (SAH).

Data of intracranial pressure (ICP), arterial blood pressure (ABP) and flow velocities of medial cerebral artery on transcranial Doppler from 42 SAH patients were analysed retrospectively. PRx was calculated as averaged Pearson's correlation coefficient between mean ABP and mean ICP over 10-second periods. Complete data sets obtained from the same patients before and during the first 21 days were available in 10 patients.

PRx at CPPopt measured during the first 48 hours was significantly lower in patients who survived 3 months after ictus than in those who died (-0.17 ± 0.05 vs 0.1 ± 0.09; $p < 0.01$). CPPopt was lower before than during vasospasm (78 ± 3 mm Hg, $n = 29$ vs 98 ± 4 mm Hg, $n = 17$; $p < 0.0001$). In the 8 patients who had data before and during vasospasm, CPPopt increased from 73 ± 3 mm Hg to 99 ± 4 mm Hg ($p = 0.002$). PRx measured at CPPopt increased (worsened) when vasospasm was confirmed.

Negative or zero PRx at optimal CPP during the first 48 hours after SAH had 87.5% positive predictive value for survival. Both CPPopt and PRx recorded at CPPopt increased during vasospasm.

P 79 @neurIST – integrated biomedical informatics for the management of cerebral aneurysms: progress report

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@neurIST believes that the current process of cerebral aneurysm diagnosis, treatment planning and treatment development is highly compromised by the fragmentation of relevant data.

@neurIST presents a new paradigm to understand and manage cerebral aneurysms.

@neurIST will provide an IT infrastructure for the management, integration and processing of data associated with the diagnosis and treatment of cerebral aneurysm and subarachnoid haemorrhage. This infrastructure will:

1) Facilitate the work of clinicians to make a diagnosis and study the disease, as a result of providing access to patient data using data fusion and processing of complex information spanning from the molecular to the whole body scale.

2) Provide a better planning of treatment after linking modern diagnostic imaging to computational tools.

3) Collaborate in the development, extension and exploitation of standards and protocols at all project stages.

4) Share biomedical knowledge providing access to a set of software tools and platforms before and after treatment.

In conclusion: @neurIST is focussed on cerebral aneurysms and intends to provide an integrated decision support system to assess the risk of aneurysm rupture in patients and to optimise their treatments.

P 80 488 nm autofluorescence identifies self-renewing and tumour-initiating glioma cells

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Glioma-initiating cells have prospectively been identified as CD133-expressing cells, retaining stem cell-like properties and tumour-initiating ability. However, a growing number of studies report that CD133 is not sufficient to fully define a cancer stem-cell subpopulation in gliomas. Development of reliable selection strategies are therefore needed for further comprehension of cellular hierarchies in gliomas.

We have identified a subpopulation of glioma cells that are specifically autofluorescent at 488 nm laser excitation (FL1+ channel). This so-called FL1+ population is prospectively isolated from freshly dissociated human glioma samples of different grades and expands as floating colonies in stem-cell culture conditions only.

Purification and characterisation of FL1+ cell population demonstrate their stemness properties in vitro including multipotency, self-renewal and preferential expression of stemness genes like NANOG and OCT4. In vivo, FL1+ cells are selectively tumourigenic, propagating and sustaining glioma growth.

Taken together, our findings suggest that self-renewing and tumour-initiating glioma cells have a distinct autofluorescent phenotype that reflects a higher metabolic state compared to the non-fluorescent one.

P 81 Endovascular treatment of experimental aneurysms in rabbits using Guglielmi Detachable Coils (GDC), stent-assisted coiling and uncovered stents

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The aim of this study was to compare the established therapy with GDC, stent-assisted coiling and the therapy with uncovered stents.

In the examination one month after coiling five animals showed an occlusion of >90%. After three months one animal presented with complete occlusion, two with an occlusion >90%.

The results one month after treatment with stent-assisted coiling showed in four aneurysms an occlusion of 90%, one presented with a reperfusion and dilatation of the neck. The angiography after three months showed in one case a complete occlusion, two aneurysms presented with subtotal occlusion and two showed a reperfusion in the region of the neck and dome. The parent vessels presented after three months in some cases with an in-stent stenosis.

The group who was treated with uncovered stents showed no regularities in the results. After one month one aneurysm showed a complete occlusion, three presented with an occlusion of 70–90% and one was reperfused. After three months two aneurysms presented with complete occlusion in the angiography, one aneurysm was subtotally occluded and two presented with an occlusion of about 70%. The carrier vessel showed a stenosis of up to 40%.

The therapy with coils remains the gold standard. Problems will be appearing in aneurysms with a high dome-neck-ratio. Comparable results are presented in stent-assisted coiling. The complete occlusion of the aneurysm with uncovered stents is satisfying and not predictable.

P 82 Surgical occlusion of low-lying basilar aneurysms using a pterional transcavernous approach including selective extradural anterior clinoidectomy (SEAC) and additional extended posterior clinoidectomy: technical note and report of two cases

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Introduction: The surgical management of aneurysms of basilar artery (BA) underneath the anterior clinoid process represents a challenge in terms of working distance, possibility of temporary clipping and exposure of the aneurysm neck. Considering the disadvantage of deep temporal retraction using the subtemporal approach, a pterional approach combined with SEAC has been proposed for the surgical occlusion of high-lying BA. In cases of low-lying aneurysms of the BA, the combination of SEAC with additional extended posterior clinoidectomy allows the surgical occlusion of the aneurysm using a pterional transcavernous approach.

Illustrative cases and surgical technique: Two illustrative cases admitted after SAH are presented. Case 1 (WFNS II and Fisher 3) presented with a dissecting aneurysm of the BA trunk which was endovascularly occluded on day 8. After angiographic signs of recanalisation the aneurysm was surgical occluded on day 19. Case 2 (WFNS II, Fisher 3) presented with a left BA-SCA aneurysm which was surgically occluded on day 5. Endovascular treatment was technically not possible. In both cases a pterional transcavernous approach with SEAC and additional extended posterior clinoidectomy was performed. Bleeding from the cavernous sinus (between ICA and third nerve) was controlled solely with fribrin glue in both cases. Placement of temporal clip on the BA was possible. In both cases a complete angiographic occlusion was documented.

P 83 MGMT expression in recurrent glioblastoma

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MGMT is a ubiquitous DNA-repair enzyme. Overexpression in tumours may confer resistance to alkylating agents. We studied MGMT expression in tissue from glioblastoma (GBM) patients from first operation and operation at recurrence. Immunohistochemistry was used to quantify MGMT protein in tissue. Expression was quantified as % of positively stained tumour cells and was correlated with clinical parameters.

At first operation patients (n = 15) clustered into two groups: ≤10% and >10% of MGMT positive cells. Patients with >10% positive cells in the first tumour sample showed increased MGMT in their recurrent GBM (n = 3, range 30 to 50, mean 37%). They all underwent concomitant radiochemotherapy (TMZ) and adjuvant TMZ. 4 patients with low MGMT staining showed increased MGMT in their recurrent tumour (range 20 to 40%). MGMT remained unchanged in the other patients with low staining. 80% of patients who received TMZ showed increased MGMT levels at recurrence. Chemotherapy with ACNU-VM26 did not lead to an increase in protein levels, nor did radiotherapy. Patients with low staining showed longer progression-free survival when compared to high MGMT staining.

The outcome of GBM patients correlates with MGMT expression determined before initiation of tumour treatment. Increasing MGMT expression is not due to biological tumour progression but appears to be related to TMZ therapy. We propose a mechanism selecting GBM cells with high MGMT expression by treatment with TMZ.

P 84 Audiovisual patient information system for invasive procedures

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The preoperative interview is used to inform patients about the general process of the scheduled surgical procedure. Furthermore, medical background information, information concerning risks, complications, treatment alternatives and continuative treatment regimes are given to the patients by the attending surgeons. The aim of this patient information system is to create a tool to enable the patient being well informed and prepared for the preoperative interview.

A modern interactive web-based patient information system has been developed. This patient information system (www.horusmed.ch) has now entered a pilot testing phase for the department of neurosurgery at the cantonal hospital of St Gall. A complete interactive information set is provided for eight standard neurosurgical procedures. Each neurosurgical procedure is composed of video, graphs, texts and recorded speech.

The acceptance of the system shall be tested in the pilot phase by means of a standardised patient inquiry. Topics of interests are whether patients want to use this system, how useful the presented information is for them, how user-friendly the system is and overall if the application of this patient information system leads to a more efficient and satisfactory preoperative interview.

This system attempts to provide the patient with information about surgical procedures in an audiovisual manner. Thus, the patient can prepare himself at home for the preoperative interview.

P 85 Epidural spinal cavernous haemangioma: case report

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Introduction: Cavernous haemangioma is an uncommon vascular malformation that may occur anywhere in the central nervous system. The incidence of cavernous haemangioma in the spine has been reported to be 0.22 cases/million/year, accounting for 5–12% of spinal vascular lesions. Pure epidural cavernomas of the spine account for only 5% of all epidural spinal lesions.

Case report: A 55-year-old man was admitted because of right L3 radiculopathy with light paresis of the right leg, hypoaesthesia L3 and radicular pain. The pain was exacerbated when he was in a sitting position. MR imaging confirmed an extradural lesion L3/L4 partially expanding into the right intervertebral foramen. The lesion had a heterogeneous signal, isointense signal on T_1-weighted and hyperintense on PD-weighted and T_2-weighted images. Contrast homogeneous enhancement on T_1 was noted. Microsurgical radical resection of the lesion could be achieved. At surgery an epidural ovoid grey-red soft mass, lightly adherent to the dura and extending to the right L3 foramen was observed. Findings in the pathological examination indicated a cavernous malformation without evident signs of haemorrhage. Symptoms and paresis improved rapidly after surgery. The follow-up MR imaging showed complete resection of the lesion with no signs of radicular compression. Radiological, intraoperative and histological findings are presented.

P 86 Expression of FGF-2 in neural progenitor cells increases their potential for cellular brain repair in the rodent cortex

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Strategies to enhance the capacity of transplanted neural stem/progenitor cells to generate multi-potential, proliferative and migrating pools of cells in the postnatal brain could be crucial for cell replacement therapies. Our objectives were to establish a neonatal rat model of neural progenitors' cell transplantation to study their in vivo behaviour and capacity to invade sites of cortical ischaemia. Using a lentiviral vector strategy, we investigated here whether the overexpression of basic fibroblast growth factor 2 (FGF-2) in neural progenitor cells (NPCs) could provide a robust source of migrating NPCs for tissue repair in the rat cerebral cortex. With live imaging we provide direct evidence that FGF-2 overexpression significantly enhances the migratory capacity of grafted NPCs in cortical slices. Furthermore, we show that the migratory and proliferative properties of FGF-2 overexpressing NPCs are maintained after in vivo transplantation. Moreover, after transplantation into a neonatal ischaemic cortex FGF-2 overexpressing NPCs invade the injured cortex and generate an increased pool of immature neurons available for brain repair. These results reveal an important role for FGF-2 in regulating NPCs functions when interacting with the host tissue and offer a potential strategy to generate a robust source of migrating and immature progenitors for repairing a neonatal ischaemic cortex.

P 87 Subsidence after anterior cervical interbody fusion. A randomised prospective clinical trial

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Currently there are a number of different interbody cages for ventral fusion after anterior cervical discectomy in use. There is still a remarkable number of cage subsidence and segmental kyphosis seen, in spite of these sophisticated implants. The present study looks whether the cage design influences the extent of correction loss during follow-up.

60 patients with single-level cervical disc herniation were randomly treated with two different cervical interbody cages (group1: Solis™ cage, group2: Shell™ cage). Clinical and radiological follow-up was done before

and after surgery, three months and six months post surgery.

Both groups were similar in the baseline parameters. Statistically the subsidence was significantly higher at 3-month and 6-month follow-ups in group1 than in group2, however, clinical results showed no significant differences. In 67% subsidence was seen in the anterior lower aspect of the treated segment. Segmental kyphosis was seen in 7 patients of group1 and 2 patients of group2. A significant correlation is found between Odom's criteria and subsidence as well as in subsidence in relation to the used device.

Although there was no significant difference in short-term clinical results between the two treatment groups, the aim should be to preserve the determined segmental height and lordosis. Therefore we recommend using cages with a large enough contact surface area at the anterior lower aspect of the implant.

P 88 A data model for structuring and mediation of knowledge on risk factors for intracranial aneurysm formation and rupture as part of the Integrated Biomedical Informatics for the Management of Cerebral Aneurysms

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Introduction: @neurIST develops an IT infrastructure for the management and processing of heterogeneous data available on intracerebral aneurysms and subarachnoid haemorrhage in order to assist clinical decision-making processes.

Methods: We used the OWL-DL-(Ontology)-Language to construct a risk-factor ontology for intracranial aneurysms and subarachnoid haemorrhage. Furthermore, ontologies can be used for the semantic mediation of data and support navigation through heterogeneous data.

Results: After a systematic review of the literature we collected information on risk factors for intracranial aneurysms and transferred it to the OWL-Ontology. The benefits of the ontology and data integration are:

1. Machine-readable large-scale databases providing annotated data for further use for clinical decision making and genetic, epidemiological and clinical research.

2. A completion for text-mining applications: text mining is drawn on information retrieval, data mining, statistics and computational linguistics.

Conclusion: The Ontology will contribute to provide structured, easy accessible information mediated by a browser for all kinds of end-users (clinicians, patients, researchers, etc.) and an extended information platform.

P 89 A rare case of an intracranial inflammatory pseudotumour: case report

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In October 2007 a 24-year-old patient was admitted to our hospital because of persistent headache and vertigo as well as two tonic secondary generalised epileptic seizures. First MRI in October showed no pathological findings and antiepileptic therapy was started.

Due to persistent symptoms and new progressive bilateral leg pain, a new MRI was performed two months later, revealing an enhancing mass of the longitudinal superior sinus and the cerebral falx. An inflammatory pseudotumour (IP) with a mononuclear infiltrate and fibrotic ground tissue was histologically diagnosed by an open biopsy and a corticosteroid treatment was begun.

IPs are well known in the lung and some other extrapulmonary locations, but IPs originating in the central nervous system (IP-CNS) are very rare. We describe this specific case and its follow-up and discuss the aetiopathogenetic, diagnostic and therapeutic issues related to this entity.

P 90 Outcome and restenosis after microsurgical carotid endarterectomy at the University Hospital of Berne

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Carotid endarterectomy (CEA) is the standard of care for symptomatic and asymptomatic high-grade carotid stenosis provided that major surgical morbidity-mortality is <7% and <3%, respectively. The results of large studies may not be applied automatically, because they may vary significantly from centre to centre. We therefore report on the results of CEA at our institution.

Between May 1998 and December 2007 all neurological and non-neurological major and minor complications of 501 patients after CEA were monitored prospectively. Vessel patency and the restenosis rate were assessed retrospectively based on sonographic findings.

The mortality was 0.4% (2/501). The rate of major stroke, minor stroke/TIA was 0.8% (4/501) and 0.8% (4/501), respectively. Other (mainly minor) complications occurred in 4.6% of the patients. The rate of high-grade restenosis after a 1-year follow-up was 4.8% (7/145).

Major and minor morbidity of this series compares favourably with data from the literature; the patch-less microsuture technique is associated with an acceptable moderate rate of restenosis one year after CEA.

P 91 Distal saccular MCA aneurysm caused by an anaplastic astrocytoma? Case report

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A 66-year-old patient was investigated by MRI because of rapidly progressive cognitive deficits. She was admitted 2 months later because of recurrent focal, secondary generalised epileptic seizures. EEG showed a right hemispheric epileptic status; a second MRI revealed a diffuse parieto-insulo-temporal T2-hyperintensity with a small contrast media enhancing lesion and a progressive aneurysm of the right MCA in the periinsular sulcus.

At surgery the saccular aneurysm was clipped and excised, and the region adjacent to the aneurysmal wall was biopsied. Histological examination showed an anaplastic astrocytoma (WHO III) with infiltration of the adventitia of the aneurysm. The patient was treated by radiotherapy.

Intracranial aneurysms are rarely seen in association with primary brain tumours and only a few cases have been published. In our case, the aneurysm has probably been caused by the malignant glioma, whereby a proteolytic attack of the arterial wall by infiltrating glioma cells can be postulated.

P 92 Sellar osteochondroma in association with pituitary adenoma: a case report

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A 74-year-old man with history of prostate carcinoma was admitted to our hospital due to headache and palsy of the right third cranial nerve in absence of other neurological deficits. MRI showed a destructive growing scull base tumour with infiltration of the sellar region, sinus sphenoidalis, clivus and sinus cavernosus with extensive calcification of the sellar portion. Endocrine function of the pituitary gland was normal. Tumour biopsy in the sinus sphenoidalis by a transseptal approach without removal of the intrasellar calcification showed an invasive growing gonadotroph-cell adenoma of the pituitary gland and subsequent radiotherapy was

performed. Due to progressive bitemporal visual loss during radiotherapy, a new MRI was arranged revealing a moderate tumour progression in the suprasellar region with compression of the chiasm probably increased through the sellar calcification. Exstirpation of the intrasellar calcification and adenoma with chiasm decompression was effected by a second transseptal transsphenoidal approach and postoperatively the field of vision improved significantly. Histological examination showed an osteochondroma in association with the pituitary gland adenoma.

To our knowledge there's no similar case in the literature. We present this specific case and its follow-up and discuss possible pathogenetical aspects.

P 93 Subcutaneous lead implantation for the treatment of chronic pain syndromes in the cervical and lumbar spine

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An epidural lead implantation for spinal cord stimulation in the treatment of chronic neuropathic pain syndromes is an often used and successful therapy. Unfortunately local pain syndromes such as lumbar back after spine surgery or neck pain after whiplash injury are no approved indications for this therapy as the painful area can just be stimulated insufficiently. We would like to present two cases in which a subcutaneous lead implantation and following stimulation in the painful area showed a significant pain reduction. Patient one received this treatment for a chronic pain syndrome in the cervical area after an axial trauma 11 years ago, patient two for chronic lumbar back pain after extensive spinal surgery.

Both patients severely reduced their opioid doses within a short time, recaptured quality of life and work capacity. Therefore in our opinion this less invasive technique should be considered for the treatment of such pain syndromes already in early stages as in the long run it will show to be a cost-effective and cost-saving therapy.

P 94 Paroxysmal otalgia treated by microvascular decompression of the intermediate nerve

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The term "geniculate neuralgia" (GN) describes a chronic disabling and episodic ear canal pain which remains a diagnostic and therapeutic challenge.

We describe a patient with typical GN treated unsuccessfully with the whole variety of available drugs. MRI with CISS sequences depicted an elongated vertebral artery with impingement of the root entry zone of the vestibulocochlear and facial nerve complex. On urgent base, through a retrosigmoid approach a microvascular decompression of this zone was performed without sectioning the nerve. During surgery the intermediale nerve was well defined and compression by the pulsatile vertebral artery was evident. A Teflon shield was placed between the nerve and the offending artery. After surgery the patient was completely relieved from pain and facial, auditory and vestibular functions were normal.

Patients with GN should be evaluated with MRI to rule out a neurovascular conflict of the intermediate nerve at the root entry zone. Microvascular decompression may be a curative procedure for GN.

P 95 Acute subdural haematomas from ruptured cerebral aneurysm: incidence, diagnosis and treatment

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The combination of ruptured aneurysms and spontaneous acute subdural haematomas (aSDH) is rare. These patients represent a distinct subgroup within the spectrum of aneurysmatic haemorrhage. We discuss details of clinical characteristics, diagnosis and management of ten cases of aSDH and SAH due to aneurysm rupture.

From January 1982 to December 2007, out of a total of 1282 patients with a verified aneurysm we found an aSDH recognised by computer tomography (CT) in only ten cases (0.78%). Radiographic evaluation included checking for presence of SAH and/or intracerebral haemorrhage (ICH), degree of midline shift and the presumed volume of the aSDH.

Except for one patient all patients were admitted in WFNS Grade 5. Two patients died after surgical decompression alone and one patient deceased after craniotomy and aneurysm clipping. All other patients received decompressive surgery, obliteration of the aneurysm by clip and maximal medical therapy as well as extensive rehabilitation. Four out of ten patients recovered completely from their neurological deficits. Two patients recovered from the ictus with mild disability.

It should be kept in mind that a ruptured aneurysm may be the source of haemorrhage in SDH patients without SAH who report no or a disproportional history of preceeding head injury. Most of these patients present in exceptionally poor neurological condition. Rapid surgical decompression and aneurysm clipping can result in favourable outcome.

P 96 Papillary tumour of the pineal region

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Objective: Papillary tumour of the pineal region (PTPR) is a relatively new and rare pathological entity. Due to its characteristic radiological and neuropathological features, it has been suggested as a distinct clinical entity. Nearly forty cases have now been reported in the literature, but only four cases describe the clinical course in some detail. As these tumours appear to run a diverse clinical spectrum, it is important that more cases with detailed clinical descriptions are reported.

Illustrative cases: We add another two cases of PTPR in a 45-year-old male and a 44-year-old female with detailed descriptions of the clinical course documented with serial imaging over two years and four years, respectively. Infratentorial supracerebellar approach has been used to gain access to the pineal region. Microscopically complete resection of the tumour was performed with/without subsequent focal radiotherapy. Up till now there has been no evidence of tumour recurrence or metastasis.

Conclusions: Two patients with intermediate and long-term follow-up after microscopically complete resection with subsequent radiotherapy have remained clinically stable without evidence of local or distant recurrence. As there are only a few described cases and limited follow-up studies, the biological behaviour and appropriate therapy for these recently described rare entities remain obscure.

P 97 Augmentation surgery in temporo-orbital contour reconstruction using a patient-specific implant

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Following standard skull base surgery temporal hollowing due to temporal muscle atrophy is common. Most often reconstruction is performed using manually moulded methylmethacrylate (Palacos). This method and material is insufficient in terms of aesthetic result and implant characteristics.

We present a patient with a large temporo-orbital haemangioma and repair with Palacos twenty years ago. Due to toxic skin atrophy fistula with consecutive infection and meningitis, the initial implant had to be removed. The disfiguring large temporo-orbital defect was reconstructed with a polyetheretherketone (PEEK)-based patient-specific implant (PSI). The lateral orbital wall as well as the temporal muscle atrophy have been augmented with computer-aided design and surface modelling techniques. The operative procedure to implant and adapt the recon-

structed PEEK-based PSI was simple and excellent cosmetic outcome has been achieved.

PEEK-based PSI is a feasible and effective method for cranioplasty and reconstruction after skull base surgery. Manual reconstruction of the temporo-orbital region is exceptionally at risk for disfiguring results. Augmentation surgery in this anatomical location needs accurate PSIs to achieve satisfactory cosmetic results. The presented cosmetic outcome is superior compared with reports using previous techniques. We suppose that Palacos is not any longer the material of choice in cranial reconstruction.

P 98 Non-linear poro-plastic model of ventricular dilatation in hydrocephalus

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Numerical finite-element (FE) models of hydrocephalus have been developed to investigate the biomechanics of ventricular enlargement. However, previous linear poroelastic models failed to reproduce the relatively larger dilatation of the horns of the ventricles. We instead elaborated a non-linear poro-plastic FE model of the brain parenchyma and studied the influence of these potentially more realistic mechanical behaviours on the prediction of the ventricular shape.

In the proposed model the elasticity modulus varies as a function of the distension of the porous matrix and the internal mechanical stresses are relaxed after each iteration thereby simulating the probable plastic behaviour of the brain tissue. The initial geometry used to build the model was extracted from CT scans of patients developing hydrocephalus and the results of the simulations using this model were compared with the real evolution of the ventricular size and shape in the patients.

Our model correctly predicted the magnitude and shape of the ventricular dilatation in real cases of acute and chronic hydrocephalus. In particular, the dilatation of the ventricular horns was much more realistic.

This finding suggests that the non-linear and plastic mechanical behaviours implemented in the present numerical model probably occur in reality. Moreover, the availability of such a valid FE model might be useful in the further modelling of ventricular dilatation at a normal pressure.

P 99 Paramedian transcondylar fossa approach in microvascular decompression for hemifacial spasm: comparison of surgical results and intraoperative monitoring findings with inferolateral suboccipital approach

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Introduction: Microvascular decompression (MVD) of the facial nerve has been established as an effective surgical procedure for hemifacial spasm (HFS). We here present our experience in MVD for HFS using paramedian transcondylar fossa approach with special attention to surgical outcomes.

Patients and methods: We performed a retrospective analysis of 45 consecutive patients with HFS who underwent surgical treatment at the Zurich University Hospital, via a lateral suboccipital retroauricular approach in 28 patients and in 17 of 45 patients via a paramedian transcondylar fossa approach. The patients were analysed on the basis of the clinical profiles, radiological studies and intraoperative findings such as operative reports or videotapes.

Results: In paramedian approach groups all patients showed complete disappearance and no recurrence of the symptoms. Postoperative hearing function remained unaffected. There was no complication case. In inferolateral approach groups 24 of all 28 patients (85.7%) showed complete disappearance of the symptoms. Four patients (14.3%) showed a 70% decrease of the spasm after the operation. There was no recurrence of the spasm. There were several patients who had postoperative complications: in 13 of 28 patients (46.2%).

Conclusion: We show here that the modified paramedian transcondylar approach enables to reduce the tension to the eighth cranial nerve, which leads to minimise the postoperative hearing disturbance.

P 100 The experience with multimodal intraoperative monitoring as a surgical aid in the removal of spine and spinal cord tumours: experience with 41 cases

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It is well established that multimodal intraoperative monitoring (MIOM) is a valid method of reliable online control of the spinal cord function. The combination of sensory evoked potentials with cerebral evoked potential combined with EMG recordings and motor-evoked potentials has proven to be accurate. We present our results in using MIOM in the resection of 41 spine and spinal cord tumours. Of the 41 patients, 21 were female and 20 male with a mean age of 48.7 years (17–83). There were 2 neurofibromas, 18 neurinomas, 5 meningiomas, 6 ependymomas, 1 fibromyxoid sarcoma (Evan's tumour), 1 cavernous angioma, 2 lipomas, 1 dermoid cyst, 1 non-Hodgkin lymphoma, 3 metastases and 1 ependymal cyst. 13 patients presented changes of monitoring pattern perioperatively, and in 5 led to significant decision making for the rest of the surgery and thus directly influenced the outcome of the patient. By direct stimulation the margins of the tumour can be better delineated and allows total removal with lesser risk of neurological damage. A detailed analysis of these data will be presented. MIOM is in our opinion an indispensable aid in spine tumour surgery because of its efficiency, reliability and can thus definitely improve the result of surgery in addition to the outcome of the patients.

P 101 C1–C3 lateral mass fixation as a treatment of odotoid osteomyelitis: a case report

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Osteomyelitis of the dens of C2 is a rare condition without standard management guidelines. Reports in the literature generally advocate surgical treatment in addition to antibiotics administration. Most of the time, a surgical resection of the dens is chosen with anterior plate fixation or subsequent posterior occipito-cervical fixation. Here we report the treatment of one case of C2 osteomyelitis treated with a C1–C3 posterior fixation with lateral mass screw placement.

A 58-year-old man, complaining of severe cervical pain, presented with fever peaks, leukocytosis and high CRP. He was neurologically intact. Blood cultures revealed penicillin-sensitive *Staphylococcus aureus.* Cervical CT and MRI pictures showed an osteolytic process of the dens of C2 suggesting an inflammatory/infectious process. A transoral biopsy of odontoid tissue confirmed osteomyelitis and cultures showed penicillin-sensitive *Staphylococcus aureus.* A lateral mass screw fixation of C1–C3 with iliac crest bone graft was performed and the patient was treated with appropriate antibiotics for 3 months. The patient evolved well and was pain free one month postoperatively. Four- and 9-month radiological follow-up showed fusion of the bone graft, no signs of cervical instability and reduced signs of inflammation. We conclude that odontoid osteomyelitis can efficiently be treated with posterior fusion and antibiotics without surgical debridement of the dens if no decompression of the cervical cord is needed.

P 102 Motion preservation using a total cervical disc replacement (Bryan, Prestige): a preliminary study of 48 patients

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Adjacent segment degeneration is a known late-complication after cervical fusion. It is postulated that motion preservation would prevent or decrease the incidence of such complications. The aim of this study was to evaluate patients with symptomatic cervical disc disease undergoing total disc arthroplasty. Indication for surgery was radicular and cervical pain related to a disc degeneration or disc herniation after an unsuccessful conservative treatment. 48 consecutive patients operated between 2003 and 2007 by cervical anterior microdiscectomy were included. Ten of the 48 patients had a two-level implant, whereas altogether 15 Bryan and 43 Prestige devices from Medtronic were used. There was no difference between males (n = 24) and females (n = 24). All patients had immediate postoperative AP and lateral X-rays repeated at 3, 6, 9 and 12 months, as well as functional lateral views. 3 patients had also a fusion on an additional segment for advanced signs of instability. None of the patients were re-operated. No implant migration inside the spinal canal or anteriorly was observed. No implant end-plate breakage was noticed. Two patients had a postoperative transient dysphonia due to laryngeal recurrent nerve retraction. These preliminary clinical and radiological results suggest that both types of implant are safe and provide excellent radicular pain relief.

P 103 Dynamic stabilisation using a PDN device (Prosthetic Disc Nucleus): a retrospective study of 104 implants in 99 consecutive patients

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Patients undergoing microdiscectomy for a disc herniation may have postoperative back pain and disc herniation recurrences. The goal of this study was to establish if these two "complications" could be affected by inserting a prosthetic disc nucleus (PDN) as well as to evaluate potential complications related to the device itself. Indication of surgery was radicular pain related to a disc herniation after an unsuccessful conservative treatment. 99 consecutive patients operated by lumbar microdiscectomy were included. Five patients had a two-level implant. There was a slightly significant difference between males (n = 57) and females (n = 38). All patients had immediate postoperative AP and lateral X-rays repeated at 3, 6 and 12 months with additional functional X-rays. 5 patients had additional interspinous stabilisation by Diam-Implant from Medtronic.

Four patients were re-operated for various reasons. On radiologic controls, rotation within the disc space was found in 37 patients without statistically significant pain correlation. One PDN migration inside the spinal canal occurred 3 weeks after surgery and required re-operation to relieve nerve root compression. No patient had a postoperative neurological deterioration. Intraspinal migration with nerve root compression is a specific device-related morbidity. This was a low risk (1/104). We think this risk should be confronted to a potential decreased disc herniation recurrence rate and postoperative back pain.

P 104 Assessment of cortical microcirculation during epilepsy surgery: a prospective comparison of two approaches using intraoperative Laser Doppler, Microdoppler and Microlight Spectrophotometry

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Background: Selective amygdala-hippocampectomy (selAH) can be performed using several surgical approaches. The aim of the present study was to prospectively assess the impact of the two main approaches (TS vs transcortical [TC]) on regional cortical perfusion and chemoreactivity.

Methods: N = 18 patients underwent selAH. N = 10 were operated via the TS approach, and n = 8 were operated via the TC approach. Cortical oxygen saturation (SO_2) was measured under hypocapnic and normocapnic conditions before and after selAH. Vasoreactivity testing was performed by modulation of end-tidal CO_2. Local SO_2, Laser Doppler flow and cortical arterial blood flow velocity were simultaneously recorded before and after resection.

Results: Cortical oxygenation increased significantly ($p < 0.05$) from pre- to post-resection levels in both groups under hypocapnia (TS pre: 49.0 ± 3.27% SO_2, TS post: 63.5 ± 2.0% SO_2 and TC pre: 48.8 ± 4.6% SO_2, TC post: 54.9 ± 3.5% SO_2) but with a smaller increase in the TC group. Similar results were obtained under normocapnia for the TS group (TS pre: 56.7 ± 2.2% SO_2, TS post: 65.5 ± 3.0% SO_2 and TC pre: 52.9 ± 5.2% SO_2, TC post: 53.0 ± 3.7% SO_2). The remaining parameters showed no difference between groups.

Conclusion: After surgery cortical hyperaemia was present in both groups, but no differences were noted favouring one approach over the other. Thus, the choice of the operative route should be based on the surgeon's preference, clinical and neuropsychological grounds.

P 105 Cortical infarct pattern in a primate model of vasospasm resembles necrosis in patients with delayed deficits after subarachnoid haemorrhage

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Background: Delayed ischaemic neurological deficits (DIND) are a devastating event after subarachnoid haemorrhage (SAH). We investigated whether the pathologic brain changes of patients with DIND occur in a widely used primate model of vasospasm after SAH.

Methods: In 16 animals a blood clot was placed around the middle cerebral artery (MCA). Additional 3 animals (control) underwent the same surgery without placement of a blood clot. 9 animals were sacrificed on day 14, the remaining animals between days 1 and 28 after surgery. The brains were harvested and examined by a neuropathologist.

Results: Three distinct types of necrosis were found: (1) Six animals showed cortical laminar necrosis. (2) Wedge-shaped infarct was observed in three cases. (3) In three brains pillar-like cortical infarcts were observed, corresponding to the supply area of a single leptomeningeal artery branch. Sham animals had no evidence of pathologic lesions. The occurrence of infarcts was not correlated with the degree of MCA vasospasm or the time-point of sacrifice ($p > 0.05$ for both).

Conclusions: The predominant pathomorphological changes consisted of lesions confined to the cerebral cortex adjacent to subarachnoid blood clot, suggesting that this model provides an experimental platform to study DIND. It is further suggested that direct pathological effects of the blood clot on cortex are responsible for this infarct pattern.

P 106 The impact of intraoperative neuronavigation on the accomplishment of an intended gross total resection in patients with glioblastoma multiforme

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The extent of surgical cytoreduction is an independent factor for the survival of patients with glioblastoma multiforme (GBM). Significant prolongation of survival time necessitates surgical cytoreduction of 98%. To accomplish such a gross total tumour resection (GTR), the use of intraoperative neuronavigation could be of assistance.

In this study we investigated the benefit of intraoperative neuronavigation for the neurosurgeon intending to perform a GTR.

272 patients with histological diagnosis of GBM were included. According to early postoperative neuroimaging, three groups were formed: patients receiving biopsy (1), partial resection (2) and GTR (3). In addition, surgeon's estimation on the extent of tumour resection was obtained from the operation report and compared with the extent of resection in postoperative imaging.

Survival time diverged significantly amongst the three groups: biopsy (79 days), partial resection (240 days) and GTR (342 days). For patients receiving a GTR, surgeon's correct estimation was 86% in the group without neuronavigation and reached 100% when using neuronavigation ($p < 0.05$).

When matched for postoperative treatment, patients receiving a GTR show a prolonged postoperative survival time compared with patients receiving partial resection. The likelihood of accomplishing an intended GTR is higher when using intraoperative neuronavigation. Its implementation in GBM surgery should therefore be standard.

P 107 Endoscopic dissection of the interthalamic adhesion

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Three patients were diagnosed with a mass in the pineal region. In all patients a right frontal endoscopic approach was used to perform both a third ventriculostomy and for biopsy of the pathological mass. After the ventriculostomy the endoscope was shifted to the posterior part of the 3rd ventricle for biopsy. In all three patients the shift of the endoscope led to a transection of the interthalamic adhesion. No significant intraoperative bleeding or postoperative clinical consequences were noted.

The interthalamic adhesion is a grey band connecting the corresponding medial surfaces of both thalami in the upper part of the lateral wall of the third ventricle. The absence of bleeding after the dissection confirms that no blood vessels run in or cross sides at the adhesion, while the absence of postoperative neurological deficits reinforces our understanding that the interthalamic adhesion contains no neural fibres.

We conclude that the interthalamic adhesion can be devided without fear of intra- or postoperative complications.

P 108 Should we operate on patients for acute traumatic subdural haematoma older than 65 years of age?

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Introduction: With an aging population a growing number of elderly people are prone to fall and suffer from an acute traumatic subdural haematoma (tSDH). Operative treatment of patients older than 65 years for tSDH remains controversial. Limited data exist in regard to expected outcome in this elderly patient group.

Methods: We retrospectively analysed 35 consecutive patients (all older than 65 years of age) undergoing craniotomy for tSDH who were treated at our Department between 1st January 2002 and 31st December 2007.

Results: 35 consecutive patients were treated for tSDH by means of craniotomy. Median age was 74 years (IQR: 11 years). 54% of patients were female, 46% male. 28 patients (80%) had significant co-morbidities and 43% of patients were treated by anticoagulation. Median initial GCS was 8 (IQR: 7) and 51% had pupillary abnormalities. Postoperative complications occurred in 18/35 patients (51%) and 13 patients died in the postoperative period (37%). Overall outcome according to Glasgow Outcome Scale (GOS) was as follows: favourable outcome (GOS 4 and 5) in 14/35 patients (40%); 7/35 (20%) of patients with GOS 3 and unfavourable outcome in 14/35 patients (40%).

Conclusion: Craniotomy for patients older than 65 years remains controversial and our case series seems to support the notion that surgical treatment is associated with a significant number of postoperative morbidity, mortality and adverse outcome. However, selected patients may profit from an intervention.

P 109 Intraoperative cerebral angiography: technical aspects and indications

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Introduction: The use of intraoperative digital substraction angiography (iDSA) is a tool in cerebrovascular surgery. According to recent studies, iDSA has been shown to alter surgical treatment in approximately 12% of cases. Moreover, it has been demonstrated that even experienced cerebrovascular surgeons might not accurately predict the need for an iDSA. Intraoperative DSA prevents unnecessary surgical manipulations after occlusion of aneurysms and accurately demonstrates occlusion rates.

Methods: Since its introduction in August 2006, a total of 35 patients underwent iDSA. Indications included intraoperative evaluation of occlusion rate of clipped aneurysms and patency of vicinity vessels (n = 29), chemical angioplasty with papaverin (n = 4) and balloon angioplasty (n = 1). In two patients a reposition of the clip was needed due to neck remnant and perfusion of the aneurysm sack after clipping. In one case the clip was repositioned due to occlusion of a vicinity vessel to the aneurysm. In one case a suboptimal occlusion of an aneurysm (Acomm) could be documented. In this case reposition of the clip was unsuccessful in reaching a total occlusion of the aneurysm and the postoperative follow-up conventional angiogram and coiling of the remnant aneurysm uneventfully performed.

Conclusions: iDSA is a feasible and safe technique which enhances the surgical quality in identifying cases of vessel occlusion or aneurysm remnant after clipping. iDSA allows altering the surgical treatment.

P 110 Selective amygdalohippocampectomy (SAHE) for intractable epilepsy: an update of 200 consecutive patients: follow-up results and future perspective

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Background: SAHE pioneered by Yasargil and Wieser in the 1970s has gained a solid position in the surgical treatment of intractable mesial temporal lobe epilepsy (MTLE). We present our experience with 200 patients who underwent conventional SAHE during the last 13.5 years.

Methods: 204 cases (age 6–66 years, m:f 1.8) underwent SAHE since 1993. This series includes, besides cases with typical Ammon's horn sclerosis and more diffuse astrogliosis, cases of cavernous angioma [6], hamartoma/dysplasia [2], DNET [2], glioma WHO I [3], glioma WHO II [5] and glioma III [12]. Long-term follow-up results were obtained in 190 cases of the mentioned series (WHO grade III and cases from far foreign countries were excluded).

Results: There was no mortality. Complications: persistent hemiparesis due to intraoperative injury of the anterior choroidal artery [n = 2], complete/incomplete homonymous hemianopsia [n = 5], haematoma (probably related to long-term AED) [n = 4], wound infection [n = 4], remarkable cognitive dysfunction [n = 1] and persistent trochlear nerve palsy [n = 1]. Excellent result in epileptic seizure cessation (Seizure outcome Engel Class I = seizure free) were obtained in 70.3% of cases and sufficient control of seizures (Class I and II) in 90.5%.

Conclusion and beyond: Our series has shown the effectiveness of SAHE for intractable MTLE. Some perspectives on the rationale and technique of selective posterior hippocampectomy (SPHE) as auxiliary method to SAHE will be presented.

P 111 Balance sheet of microvascular cerebral revascularisation during the period 1993–5.2007 in Neurochirurgische Universitätsklinik Zürich

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Background: Microvascular revascularisation pioneered by Yasargil and Donaghy in 1967 has stepped back in the field of neurosurgery since the international cooperative study of EC-IC bypass on stroke prevention in 1985. We present our balance sheet of various applicability of the procedure during the last 14 years.

Methods: 173 patients underwent microvascular revascularisation 250 times: atherosclerosis (n: 76), Moyamoya angiopathy MMA (n: 47), aneurysms (n: 45), and skull base tumours (n: 5). Most of cases underwent revascularisation to the territory of the MCA, ACA in 23 cases, and to the posterior circulation in 13 cases. Indication was mostly based on symptoms, angiographical findings and haemodynamic insufficiency on $^{15}H_2O$ PET. Indication was also given on individual basis in emergency cases of aneurysm surgery.

Results: Long-term patency was 85% based on angiographic or sonographic findings (80%). Our results of stroke prevention on cases of atherosclerosis are presented and compared with the Japanese EC/IC bypass trial study showing a significant role in stroke prevention in cases with MMA, aneurysm surgery (giant/dissecting), vasospasms after SAH and skull base tumours.

Conclusion and beyond: Microvascular revascularisation procedure should always be kept in mind and one should be ready to perform this in order to prevent disastrous cerebral ischaemia. Our new techniques of revascularisation to the territory of the ACA and to the posterior circulation are also presented.

Schweizerische Gesellschaft für Neuroradiologie SGNR

P 112 FMRI supported targeting for DBS in a patient with short-lasting unilateral neuralgiform headache attacks with conjunctival tearing (SUNCT)

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Objective: Hypothalamic and thalamic involvement is described in pain situations. Deep brain stimulation (DBS) has been performed in short-lasting unilateral neuralgiform headache attacks with conjunctival tearing (SUNCT). Our purpose is to establish a method for functional magnetic resonance imaging (fMRI) combined with high-resolution MRI to support DBS targeting.

Patient history and methods: A 66-year-old patient has been suffering from SUNCT on the right side for 37 years. The pain attacks can be provoked by external stimuli. T_2-weighted images and standard fMRI sequences were acquired at 3 Tesla System (Siemens Medical Solutions, Erlangen, Germany) Trio TIM during rest and during a provoked pain attack. The data were postprocessed by Brain Voyager using block paradigm and with independent component analysis (ICA).

Results: There was a significant increase in blood oxygen level dependent (BOLD) signal during provoked pain compared to baseline in the right thalamus, in Nucleus principalis trigemini, in periaquaductal grey matter and bilaterally, accentuated on the right side in hypothalamus. There was co-activation in the Gyrus cinguli and parietal lobes.

Conclusion: FMRI is feasible in selected pain patients and allows visualisation of the brain areas involved in complex pain situations. The combination of high field MR images with detailed identification of nuclei with fMRI allows for more targeted functional neurosurgery.

P 113 Non-communicating syringomyelia – a rare feature of spinal cord involvement in multiple sclerosis

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Introduction: In patients with multiple sclerosis (MS) non-communicating syringomyelia (NCS) has been described as an incidental finding in case studies which may lead to diagnostic uncertainty. Up to date little is known about the prevalence and clinical importance of NCS in MS. We report the imaging and clinical characteristics of NCS formations in 9 MS patients from a 1-year follow-up study.

Methods: Standardised brain and biplanar SC MRI of 202 MS patients (140 women, 62 men, 24–74 years old, EDSS 0–7.0) with different MS subtypes was analysed as part of a genetic study employing multi-array-coils and parallel imaging technology.

Results: SC MRI demonstrated the typical sequelae of inflammatory-demyelinating disease: focal lesions, diffuse abnormalities and signs of atrophy. In 9/202 patients (4.5%) an NCS of variable size (length: 2.5–17 cm, diameter: 15–50 mm) with CSF signal intensity was identified. One-year f/u MRI demonstrated in all cases unchanged phenomenology. Despite thorough search into the clinical history and current clinical status no definite but only minimal indications of symptoms potentially related to the NCS were found.

Conclusion/discussion: We confirm that NCS may occur in MS patients with spinal cord pathology. It can be a subtle finding without clinical correlates. Syrinx formations are more likely to be a consequence of MS cord pathology than a coincidental finding.

P 114 Biplanar spinal cord MRI in MS – depiction of cord pathology and improvement of clinical correlations

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Introduction: The spinal cord (SC) of MS patients is frequently involved but the identification of pathology is technically demanding. We employed biplanar SC MRI and tried to implement a new SC abnormality score (SAS) in order to overcome the weak association between clinical symptoms and MR findings.

Methods: Standardised biplanar SC MRI of 202 MS patients (140 women, 62 men, 24–74 years old, EDSS 0–7.0) with different MS subtypes was employed on a 1.5 T MRI system using multi-array-coils and parallel imaging technology. Pathological cord changes (e.g. focal lesions, diffuse changes, atrophy) were graded in 4 levels constituting the SAS. Spearman's rank was used to analyse relationships between SAS, EDSS and FSS.

Results: About 34% of patients showed no or minimal changes (SAS = 0 or 1), whereas 30% of patients were rated with a SAS of 2 (moderate) and 36% of patients showed severe cord pathology (SAS = 3). EDSS, motor and sensory FSS showed fairly strong correlations with the SAS (EDSS: SR: 0.55, $p < 0.001$; motor FSS: SR: 0.49, $p < 0.001$; sensory FSS: SR: 0.52, $p < 0.001$).

Conclusion: We present a new approach categorising SC abnormality which in contrast to previous studies incorporates different aspects of MS pathology and shows good correlation with clinical measures of disability (EDSS, FSS). The combination of improved visualisation of SC pathology and its integration into a combined score may overcome some of the difficulties in the detection and interpretation of SC MRI results.

P 115 An animal model for cortical pathology of multiple sclerosis

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Recently it has been demonstrated that cortical pathology is present in multiple sclerosis. So far it is not well understood how cortical lesions develop and to what extent they contribute to the disease manifestation. Potentially they are the primary correlate for progressive disability and cognitive impairment in multiple sclerosis. We have developed an animal model of cortical pathology in MHC congenic LEW.1AR1 (RT1r2) rats. After active immunisation with the extracellular domain of myelin-oligodendrocyte-glycoprotein they present all types of cortical lesions that have been shown to be characteristic in chronic multiple sclerosis. In this model we are presently evaluating the mechanisms which lead to this type of pathology which is dependent on a specific MHC haplotype. This finding underscores that also in multiple sclerosis development of cortical pathology may be controlled genetically. We explore this model regarding pathogenetic mechanisms leading to cortical lesions by histopathology, immunology and molecular biology and evaluate the efficacy of preclinical therapeutic interventions which may be used for treatment of multiple sclerosis. *In summary* we have established an animal model in rats for cortical pathology of multiple sclerosis which will be explored in multiple ways.