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Brain tissue hypoxia is an independent predictor of outcome in patients with severe traumatic brain injury

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Objectives: To examine whether brain tissue hypoxia is an independent predictor of outcome in patients with severe traumatic brain injury (TBI).

Design: Prospective observational study.

Setting: Neurocritical care unit, academic Level 1 trauma center.

Patients: Consecutive patients who underwent intra-parenchymal brain tissue oxygen pressure (PbtO₂) and intracranial pressure (ICP) monitoring for at least 24 hrs after severe TBI.

Intervention: None.

Measurements and main results: PbtO₂, ICP, mean arterial pressure (MAP) and cerebral perfusion pressure (CPP = MAP-ICP) were monitored continuously and recorded every 30 minutes. Using linear interpolation, we calculated total duration, dose (area under the curve [AUC]) and severity (AUC/duration) of brain hypoxia (PbtO₂ <15 mm Hg for >30 min), and analyzed its association with neurological outcome. From January 2002 to October 2006, 103 consecutive patients, monitored for an average of 5 days, were studied. We measured 282 episodes of brain hypoxia in 66 (64%) patients. Brain hypoxia was frequently observed despite ICP <20 mm Hg and CPP >60 mm Hg (on average, 73% and 49% of monitored time, respectively). At hospital discharge, 57 (56%) patients had favorable outcome (Glasgow Outcome Score 4 [moderate disability] or 5 [good recovery]). On univariate analysis, age, Glasgow Coma Scale, Marshall CT score, APACHE II, duration and dose of elevated ICP >20 mm Hg, duration, dose and severity of brain hypoxia, were all significant predictors of outcome (all P <0.05). By multivariable logistic regression, the severity of brain hypoxia was the only independent physiological predictor of outcome (adjusted odds ratio for favorable outcome, 0.73; 95% confidence interval, 0.57–0.93; P = 0.01).

Conclusion: Despite normal ICP and CPP, brain hypoxia is frequent and is strongly associated with poor outcome after TBI, irrespective from ICP, CPP and injury severity. Our data indicate that PbtO₂ is an independent prognostic marker after TBI and warrant further study to examine whether PbtO₂-targeted therapy improves the outcome of TBI patients.

Optic radiation fiber tracking using anteriorly angulated diffusion tensor imaging: A tested algorithm for quick application

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Introduction: Intraoperative MRI including fiber tracking supports preservation of eloquent white matter in cases, where tumor removal is performed in close relationship to highly eloquent white matter. Image acquisition, image processing and fiber tracking are time consuming and can increase the length of surgery. To identify parameters for high speed DTI and fiber tracking of the optic radiation we performed a multivariate imaging study.

Methods: Six different DTI datasets were acquired from a healthy 31 years old male with a slice thickness of 2.7, 5 and 7 mm. They were scanned in straight axial manner as well as angulated by 44 degrees anteriorly to bring mainly frontodorsal fiber bundles as the optic radiation in as much an orthogonal relation to the image planes as possible. Fiber tracking was performed using different parameters for focal anisotropy and minimal fiber length thresholds. The quality of the resulting fiber objects and the time needed for each step were recorded. The parameters, which resulted in the best fiber objects were applied to the pre- and intraoperative MRI of seven patients with temporal, temporoparietal or occipital lesions.

Results: Fiber tracking was possible with excellent results in 2.7 mm DTI with 6 motion probing gradients. Even the Meyer's loop was successfully tracked in a distance of 26.1 to 26.9 mm posterior of the temporal pole, which is comparable to the results of fiber-dissection studies. 5 and 7 mm DTI did not allow fiber tracking in acceptable quality. The results could be improved by anterior angulation of the scans. The whole procedure from imaging to completion of the fiber tracking took between 7:53 and 18:07 minutes. Suitable thresholds for focal anisotropy were 0.05 and 0.1 and for minimal fiber length

5 to 30 mm. Application of these parameters to the intraoperative MRI of seven patients proved, that the additional DTI and fiber tracking added less than 5 minutes to the time required.

Conclusions: Optic radiation fiber tracking is possible in good quality with relatively low performance DTI and little need for additional time. We identified parameters, which allow regular intraoperative use and described an easy and fast algorithm for optic radiation fiber tracking.

Case Management in Neurosurgery – A new tool to provide excellent care under DRG

Karl F. Kothbauer, Andrea Sticher, Antoinette Conca

Introduction: In the United States “workforce extenders” such as nurse practitioners and physician assistants have provided an increasing share of direct patient care as availability of surgeons and residents have become scarce due to work hour restrictions and scarce economic resources. The economic pressure exemplified by case-based reimbursement (DRG) to provide the same care to neurosurgical patients during ever shortened hospital stays carries a significant risk of decreased quality of care, increased incidence of errors and reduced patient and staff satisfaction.

Methods: We planned a one-year pilot project for the recruitment of a nursing based “case manager” as the Swiss equivalent to the nurse practitioner to test the effect of the case managers care on hospital stay, the amount of nursing care provided during the time of admission, the satisfaction of patients and staff, and additional factors such as the completeness of filed medical information. We compared two patient groups, a “case-managed” group admitted for a variety of elective neurosurgical procedures (n = 54) with outpatient presurgical testing, same day admission and shortened hospital stay to a second group of neurosurgical patients (n = 47) who were admitted one day prior to surgery, had all testing done then and were discharged according to previous practice. The first group was managed with the help of the case manager, the second group without, using previous practice patterns. The groups were not randomized. Hospital stay, nursing care requirements, patient satisfaction and staff satisfaction were measured using software based tools (LEP) and questionnaires. **Results:** The case-managed group had a shorter hospital stay (4 vs. 8 days) and significantly lower nursing care requirements (833 vs. 1724 minutes). Patient satisfaction did not differ between the groups and staff satisfaction with the work of the case manager was very high.

Conclusion: A nursing-based case manager provides a significant contribution to the quality of care provided by a neurosurgical practice group or division. It helps speed up the process of outpatient preparation, admission, and discharge planning without loss of patient satisfaction. Significantly shorter hospital stays, less nursing care requirements are tolerated. The acceptance of the case manager by nursing and physician staff is high.

Which amounts of antioxidant micronutrients are delivered to ventilated critically ill children?

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Introduction: In critically ill patients, there is an increasing interest in micronutrients having an antioxidant role. In children, requirements and actual intake in micronutrients have not been determined and current recommendations are based on healthy children. The aim of this study was to compare antioxidant micronutrients intake with the Dietary Reference Intake (DRI) and energy intake with the Recommended Dietary Allowances (RDA).

Methods: Antioxidant micronutrients (vitamins C, E, copper, zinc, selenium) and energy intakes were prospectively studied in mechanically ventilated children. Parenteral and enteral intakes were recorded daily using a computerized clinical information system. Resting energy expenditure was measured (REEm) daily by indirect calorimetry. Comparisons were made with the DRI and RDA using t-tests.

Results: 49 children were included, 25 boys and 24 girls. Mean age (±SD) was 25.0 ± 23.8 months with a weight of 9.6 ± 5.3 kg and height of 78.0 ± 21.2 cm. Reasons for admission were mainly post surgery and respiratory illness. PRISM score was 5.2 ± 3.4 on day 1. Children were mostly enterally fed except 3 on mixed nutrition (parenteral and enteral). 409 days were analyzed and 236 indirect calorimetry measurements performed. Vitamins C and E intakes were higher than the DRI with 63.7 ± 52.2 and 9.2 ± 8.2 mg/d respectively (314 ± 333% and 168 ± 148% of the DRI, p <0.001; p <0.001). Zinc

and copper intakes, 2.9 ± 3.2 mg/d and 320 ± 337.8 mcg/d, were closer to the DRI ($154 \pm 270\%$ and $123 \pm 125\%$; $p = 0.067$; $p = 0.009$). By contrast, selenium intake was 13.2 ± 17.8 mcg/d and reached only $81 \pm 125\%$ of the DRI ($p < 0.001$). Recommendations were reached in the first three days of hospitalization, except for selenium. Differences were observed between age groups mainly because of the large differences in recommendations according to age. Energy intake was 49 ± 25 kcal/kg/d. REEm was 56 ± 11 kcal/kg/d and represented only $55 \pm 9\%$ of RDA.

Conclusion: Vitamins C, E, copper and zinc intakes exceeded the DRI for healthy children. Selenium was lower than the recommendations. Large differences occurred among micronutrients and age groups. Energy expenditure was not as high as expected.

Dekubitusmanagement bei kritisch kranken Patienten der Intensivstation

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Hintergrund und Zielsetzungen: Kritisch kranke Patienten weisen ein stark erhöhtes Risiko für die Entwicklung von Dekubitus auf. Die Dekubitusinzidenz im intensivmedizinischen Bereich variiert international zwischen 5,2% und 20%. In der Literatur finden sich verschiedene Risikofaktoren die ein stark erhöhtes Risiko für eine Dekubitusentwicklung darstellen. Aufgrund dieser Ausgangslage wurde ein Qualitätsprojekt vorgenommen, das die Dekubitusinzidenz und Dekubitusgefährdung anhand von Risikofaktoren erfasst. Zudem wurde die Dekubituspräventions- und Therapiekompetenz der Pflegefachpersonen gefördert und gezielte Präventionsmöglichkeiten implementiert.

Methoden: Die Daten zur Dekubitusinzidenz wurden während zwei Jahren elektronisch und fotografisch (Januar 2007 bis Dezember 2008) bei über 6000 Patienten erfasst. Eingeschlossen wurden alle erwachsenen Patienten. Die Einteilung der Dekubitusstadien erfolgte anhand der Stadieneinteilung des European Pressure Ulcer Advisory Panel (EPUAP). Zur Einschätzung der Risikofaktoren diente ein lite-

raturbasierter Erhebungsbogen. Die Datenerhebung fand 8 stündlich statt. Parallel wurden die Pflegefachpersonen geschult, eine Wundfachgruppe aufgebaut und eine Wundvisite implementiert. Interdisziplinäre evidenzbasierte Handlungsanweisungen und der Einsatz von neu entwickelten Hilfsmaterialien bildeten weitere Grundlagen der Dekubitusprävention.

Resultate: Die Inzidenzrate konnte von 4,0% im Jahre 2007 auf 2,3% im Jahre 2008 reduziert werden. Die meisten vorbestehenden und neu aufgetretenen Dekubitus wiesen das Stadium I und II auf ($73\% / N = 130$). Druckschäden des Grades III und IV lagen bei 37% ($N = 46$) und zeigen keine Unterschiede zum Jahre 2007. Dekubitusulcera lagen vor allem in der Gesäss und Steissbeinregion vor, gefolgt von der Fersenregion. Atypische Lokalisationen wie der Gesichts- und Brustbereich, sowie der Hinterkopf und die Fussknochen kamen hinzu. Als signifikante Risikofaktoren wurden pulmonale Erkrankungen und Tumorerkrankungen ermittelt ($p \leq 0,05$). Höher gradige Dekubitus wurden bei Sepsis, Diabetes mellitus, pulmonalen Erkrankungen und Stuhlinkontinenz festgestellt (Signifikanzniveau 0,05). Bei weiteren Risikofaktoren konnten keine statistische Signifikanz ermittelt werden. Präventionsmöglichkeiten wurden situativ eingesetzt und eine Positionsveränderung erfolgte im Durchschnitt alle 1,5 Stunden.

Schlussfolgerungen: Die Identifikation gezielter Risikofaktoren kann helfen, Risikopatienten frühzeitig zu erfassen um eine gezielte Prävention einzuleiten. Die Dekubitusinzidenz wird durch Kompetenz und Wissen des Fachpersonals, gezielten Einsatz von Hilfsmaterial, interdisziplinäre Zusammenarbeit, regelmässige Erfassung und Evaluation erfolgreichen beeinflusst.

Literatur

de Laat EH, Schoonhoven L, Pickkers P, Verbeek AL, van Achterberg T. Epidemiology, risk and prevention of pressure ulcers in critically ill patients: a literature review. *J Wound Care*. 2006;15(6):269–75.
Frankel H, Sperry J, Kaplan L. Risk factors for pressure ulcer development in a best practice surgical intensive care unit. *Am Surg*. 2007;73(12):1215–7.

FREE COMMUNICATIONS 1 ZEREBRALE DYSFUNKTION

Super-Selective Catheterization of the Inferior Petrosal Sinus in Detecting an Adenoma in Cushing's Syndrome

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Introduction: Non-invasive detection of a micro adenoma in ACTH-dependent Cushing's syndrome is still an imprecise method. We describe the use of super-selective catheters in bilateral petrosal sinus sampling performed in patients with clinical Cushing's syndrome and ambiguous MR findings and discuss the role of this method in comparison to MR imaging.

Methods: We performed bilateral inferior petrosal sinus sampling (BIPSS) in 20 patients with fulfilled clinical and biochemical criteria of Cushing's syndrome and normal or non-specific MR findings. BIPSS was performed by bilateral insertion of a 6F guiding catheter in the femoral vein. The inferior petrosal sinus was catheterized bilaterally with a Hi-Flow Tracker catheter. A third catheter was placed in a peripheral vein. ACTH blood concentration was measured in two baseline samples that were taken from each of the three catheters; further samples were taken 3, 5, and 10 minutes after i.v. stimulation with ovine corticotropine releasing hormone.

Results: In 18 patients, a central/peripheral ACTH gradient was found, and lateralization could be made. Retrospective analysis of the MRI studies after BIPSS showed erroneous reports in 50%. In 15 of 17 cases where transsphenoidal partial hypophysectomy was performed based on BIPSS findings, adenoma was histological confirmed. MRI yielded a significant lower sensitivity with 54% compared to 94% in BIPSS.

Conclusion: Bilateral inferior petrosal sinus sampling is a laborious procedure. It is, however, significantly superior to MR imaging in the accurate detection of pituitary pathology in cases of central Cushing's syndrome.

Surgical Management of Cervical Spondylotic Myelopathy with Laminectomy

K. Winkler, A. Khamis, H. Landolt, J. Fandino

Introduction: Cervical dorsal decompression in patients presenting with cervical spondylotic myelopathy with no signs of instability, is still considered a standard surgical option. The aim of this study was to evaluate the clinical outcome in terms of myelopathy signs, radiological findings, and surgical complications in a consecutive series of patients treated in our institution.

Methods: This retrospective study included a total of 65 adult patients (66 ± 13 years, 19 women, 46 men) who underwent laminectomy for cervical myelopathy during an 8-year period (2000–2007). In all patients spondylotic changes and stenosis of the cervical canal was confirmed (MRI). Additional preoperative assessment included cervical CT, standard plain anterior-posterior, lateral and lateral flexion-extension radiographic views, and neurophysiological evaluation, if indicated. Laminectomy was performed in 56 (86.2%) patients including one level ($n = 5$, 8.9%), two levels ($n = 19$, 33.9%), and three or more levels ($n = 32$, 57.1%). Nine (13.8%) patients underwent laminoplasty. Dorsal fusion was performed in one case. Intraoperative radiological verification and microsurgical exploration of the canal was routinely performed. Postoperative evaluation included radiological (MRI) and clinical assessment of gait, radicular pain, neurological deficit and disability.

Results: Preoperative symptoms were documented as follows: gait disturbance ($n = 46$, 70.7%), radicular pain in the upper ($n = 30$,

46.1%) and lower limbs (n = 14, 21.5%), sensory loss in the upper (n = 41, 63.1%) and lower limbs (n = 28, 43%), motor deficits in the upper (n = 37, 56.9%) and lower limbs (n = 32, 49.3%). The overall clinical outcome was assessed at 15 ± 17 months. Improvement of gait disturbance was documented in 34 (73.9%) patients. Radicular pain in the upper and lower extremities improved in 26 (86.7%) patients and 7 (50%) patients, respectively. Sensory deficits in the upper and lower extremities improved in 31 (75.6%) and 15 (53.5%) patients, respectively. Motor deficits in the upper and lower extremities improved in 26 (70.2%) and 18 (56.3%) patients, respectively. Surgical complications included postoperative instability (n = 1, 1.5%), superficial wound infection or dehiscence (n = 2, 3%), postoperative loosening of the halo vest (n = 4, 6.1%), progressive Myelopathy (n = 3, 4.6%), others (n = 3, 4.6%). A total of 6 (9.2%) patients underwent reoperation for extension of laminectomy due to persistent myelom compression. A total of 7 (10.7%) patients underwent additional scheduled ventral decompression as part of the surgical strategy. One patient (2.1%) developed a deterioration of the gait disturbance after decompression. No perioperative mortality was observed in this series.

Conclusions: Dorsal decompression for cervical myelopathy without instability signs is a safe and effective approach. With proper patients' selection and attention to surgical technique, laminectomy has to be considered as a treatment option of these patients.

Long-term outcome after double-adjacent-level anterior cervical microdiscectomy and fusion using plasmaphore covered titanium cages only

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Objectives: To evaluate the long-term outcome of two-adjacent-level microsurgical anterior discectomy (ACD) using plasmaphore coated titanium cages (PCTC) without plate implantation.

Subjects: A total of 34 consecutive patients presenting with degenerative cervical disc disease (DDD) underwent surgery. No plate system was implanted. Surgery was performed in at levels C5-6 and C6-7 in 30 patients, and at C4-5 and C5-6 in 4 patients. 28 patients presented with one- or two-level radiculopathy and six with additional progressive myelopathy signs. Long-term evaluation (mean: 61.60 ± 13.88 months, range: 3–7 years) included clinical and radiological assessment. Radiological evaluation included dynamic studies, evaluation of bone fusion, cage extrusion, disc space and height, subsidence, and kyphosis. Patient's ability to work, functional outcome according to the Odom's criteria (OC), and subjective outcome (SO) were documented.

Results: 73% of the patients had a good (44%) or excellent (29%) outcome. Seven patients (21%) described fair and 2 patients (6%) a poor outcome due to persistence of neck pain (5), radicular pain (5) and/or neurological deficits (5). 68% of the patients resumed their previous work capacity or were retired at the time of the evaluation. In the long-term radiological assessment, fusion of the two levels could be documented in 27 of 28 patients (96%), in one case signs of fusion were observed only in one level. In two patients (7%) long-term kyphotic cervical deformity was observed. One patient had to be reoperated 3 months after surgery because of instability in the operated segments.

Conclusions: Two-level ACD using PCTC without implantation of plates is safe and achieves similar clinical outcome and fusion rates associated with bone graft or plate implantation. ACD for two-level cervical DDD without implantation of plates is associated with a lower morbidity and costs.

Extracorporeal Blood Shunt Mimicking Aneurysm Rupture: New Rabbit Subarachnoid Hemorrhage Model for the Study of Delayed Cerebral Vasospasm

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Introduction: Due to relatively low costs and easy handling rabbits became the most popular species in cerebral vasospasm research. The most often applied technique to simulate subarachnoid hemorrhage (SAH) in the rabbit is injection of blood into the cisterna magna.

This technique comprises examiner-dependent variables and does not closely represent the human pathophysiological sequelae of ruptured cerebral aneurysm. The degree of vasospasm produced in this model is mild. That contributes to the fact that numerous therapeutic procedures appear to relieve experimentally induced vasospasm but turn out to be ineffective when used clinically.

Methods: Adult female New Zealand rabbits were assigned to two groups (SAH group, n = 10 and controls, n = 2). SAH was performed by shunting blood from the subclavian artery into the great cerebral cistern. An intermediary flow meter measured the blood volume which streamed under arterial pressure into the subarachnoid space. Intracranial pressure (ICP), arterial blood pressure, heart rate, arterial blood gas status, and neurological status were monitored throughout the experiments. The magnitude of spasm in the basilar artery was determined by comparison of pre-SAH (day 0) and post-SAH (day 3) angiograms and post-mortem morphometric analysis of the basilar artery as well as gross examination of the brain.

Results: A total of 18 experiments and 36 angiograms were performed. ICP (42.6 ± 1.2 mm Hg) rose to diastolic blood pressure (39.7 ± 12.3 mm Hg) in 97 ± 35 seconds and fall to a steady state within 185 ± 73 seconds. SAH induced vasoconstriction of the basilar artery was 52.7 ± 8.4%. Coronal sections of basilar arteries at proximal and middle brainstem level demonstrated significant vasoconstriction on day 3 after SAH induction with massive corrugation of elastic internal lamina. Post-mortem gross examination of the brain showed large blood clots located around the brainstem and ventral surface of the brain.

Conclusions: This novel technique of SAH induction resulted in significantly higher degree of delayed cerebral vasospasm compared to all other previous reported rabbit models. The severity of vasospasm attained offers a unique opportunity to evaluate future therapeutic treatment options. Monitored physiological parameters confirmed the close relation to the human situation of intracranial aneurysm rupture. Exact time course of the new model and its role to study early brain injury after SAH remains to be determined.

CT-Angiography for the Evaluation of Cerebral Circulation in Brain Death Diagnosis

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Introduction: The cessation of cerebral circulation is an important aspect for the confirmation of brain death (BD). The gold standard for cerebral vessel evaluation is conventional angiography. However, CT-angiography (CTA) has become an alternative examination due to lower costs and widespread availability. The Swiss legislation accepts CTA as an additional tool to establish the diagnosis of BD. We report our initial experiences using CTA in the course of BD evaluation.

Methods: Between 2007 and 2009 a total of 26 patients (14 female, 12 male, mean age 46 y, range 17 to 85 y) were examined using CTA to confirm cessation of cerebral blood flow. Cause of clinical presentation was a direct trauma to the head in 8 cases, primarily intracranial disease (e.g. SAH, ICH) in 11 cases and systemic causes in 7 cases. Examination protocol consisted of a non-enhanced head scan followed by a bolus-triggered CTA of the head and neck vessels. For CTA 80 ml of Iopamiro 300 were injected intravenously with a flow rate of 4 ml/sec. Transverse source images as well as coronal and sagittal reformations were assessed.

Results: Study protocol was feasible in all patients. In 20 cases the cessation of cerebral circulation was confirmed by initial CTA. In six cases the cessation of brain circulation could not be confirmed due to residual contrast enhancement of cerebral arteries (communicating segment ICA: 6, M1 segment MCA: 5). In two cases CTA was repeated within 12 hours and the second CTA confirmed the cessation of blood flow to the brain.

Conclusions: CTA is a feasible alternative examination to evaluate the cerebral circulation and is an additional tool to confirm the diagnosis of brain death. Further evaluation of sensitivity, specificity is needed to improve the impact of CTA in the evaluation of these patients.

Nivicuss 1: Non-invasive ventilation in the ICU: Swiss survey. Preliminary results

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Introduction: The real scenario of the practical modalities for non-invasive ventilation (NIV) in the Swiss ICUs has never been reported. We therefore aimed to assess this clinical practice through a survey conducted from 01/09 in all (n = 83) Swiss ICUs (neonatal units excluded).

Methods: A postal questionnaire(Q) was addressed to 83 adult and 4 pediatric units. Main investigated fields were: indications, selection of patients, interfaces used, modes of ventilation and time of ventilation.

Results: Up to May 09, 49 (6 university and 43 non-university) centers completed the Q (65,5%), 34 from the German, 10 from the French and 5 from the Italian part of Switzerland. Mean experience with NIV was 11.8 years. Between all ventilated pts, the NIV proportion was less than 20% in 19, between 21 and 40% in other 19, between 41 and 60% in 5 and between 61 and 80% in 6 units. ARF in COPD (94%), acute cardiogenic lung edema (ACPE; 96%), ARF in do-not-intubate pts (69%), extubation failure (63%), ARF in post-operative states (59%), ARF in immunosuppression (53%) and severe pneumonia (49%), were considered the main NIV indications, while NIV in ALI/ARDS was reported in only 14 units. First line interface was the oro-nasal (facial) mask and the first-line ventilator was an ICU device. PS+PEEP was the first-line mode in ARF-COPD (86%), in ACPE (72%) and in severe pneumonia/ALI/ARDS (79%). CPAP for ACPE was uncommonly used.

Conclusions: Compared to recent data (1, 2), most Swiss ICUs use NIV in a higher percentage of all ventilated pts. Most units apply the currently proposed guidelines (2) of NIV but some still use CPAP in hypercapnic ARF in COPD-pts and rarely in ACPE. Some practices could be improved through a network organization for NIV management.

Clinical performance of non-invasive ventilation (NIV) modes on ICU ventilators during pressure support: preliminary results

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Introduction: 43% of patients undergoing NIV exhibit severe asynchrony, mainly associated with leaks [1]. Specific NIV modes to decrease the impact of leaks have been designed, but remain untested in clinical conditions.

Purpose: to evaluate in the clinical setting the effect of NIV modes on the incidence & severity of asynchrony.

Method: prospective multicenter observational study of pts. with ARF receiving clinician-set pressure support NIV. Two 30 min. periods of continuous recordings were performed, without (NIV0) and with (NIV+) NIV mode. Respiratory rate, pt. neural inspiratory time (tin), duration of ventilator pressurization (tiv), excess pressurization duration (tiexcess = tiv - tin / tin x 100), n asynchrony events (AE) and Asynchrony Index [AI= n asynchrony events / (triggered + non-triggered breaths)]. Results (mean ± SD): 55 pts (23F/32M); age = 69 ± 13 yr.; BMI = 25 ± 5 kg.m⁻², PSL = 13.5 ± 3 cmH₂O, PEEP = 6 ± 1 cmH₂O.

	NIV0	NIV+
Leaks (L/min)	3.2 (1-6)	3.2 (1-6)
VTe (ml)	590 ± 215	585 ± 203
Respiratory rate (n/min)	26.2 ± 8	25.5 ± 8
Tin (s)	824 ± 240	846 ± 240
Tiexcess (%)	28 ± 17	18 ± 18*
double triggering (n/min)	0.01 (0-0.2)	0.03 (0-0.2)
auto-triggering (n/min)	0.3 (0.1-0.8)	0.1 (0.04-0.4)*
non-triggered breaths (n/min)	0.3 (0.2-1.6)	0.17 (0.07-0.5)*
premature cycling (n/min)	0.2 (0.04-1.8)	0.4 (0.3-3)
delayed cycling (n/min)	0.12 (0-0.07)	0.02 (0-0.03)*
Asynchrony index %	9.5 (4-32)	7 (3-34)

*p = 0.05 vs NIV0. Values are expressed in mean ± SD or median (IQR) according to their distribution.

Conclusion: During NIV with leaks, asynchronies can be partly corrected by NIV mode, mainly delayed cycling, ineffective efforts and auto-triggering. The present ongoing trial should provide further insight as to the clinical relevance of specific NIV modes in patients with ARF.

1 Vignaux L, et al. Intensive Care Med. 2009;35(5):840-6.

Can Neurally Adjusted Ventilatory Assist improve patient-ventilator interaction? a preliminary study

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Introduction: Neurally Adjusted Ventilatory Assist (NAVA) is a new spontaneous-assisted ventilatory mode based on the detection of diaphragmatic electrical activity (Eadi) and its feedback to adjust ventilator settings. NAVA uses the Eadi, an expression of the respiratory center's activity, to initiate pressurization, set the level of pressure support and cycle the ventilator into exhalation. Therefore, NAVA should theoretically allow near-perfect synchronization between the patient and the ventilator. However there are few data documenting these effects in intensive care patients.

Objectives: To determine whether NAVA can improve patient-ventilator synchrony compared to standard pressure support (PS) in intubated intensive care patients.

Methods: Comparative study of patient-ventilator interaction during PS with clinician determined ventilator settings and NAVA with NAVA gain (proportionality factor between Eadi and the amount of delivered inspiratory pressure) set as to obtain the same peak airway pressure as the total pressure obtained in PS. A 20 minute continuous recording with each ventilatory mode was performed allowing determination of trigger delay (Td), patient neural inspiratory time (Tin), duration of pressurization by the ventilator (Tiv), excess duration of pressurization (Ti excess = Tiv-Tin / Tin X100) and number of asynchrony events by minute: non-triggering breaths, auto-triggering, double triggering, premature and delayed cycling. Results are given in mean ± SD. p is considered significant if <0.05.

Results: Preliminary results (mean ± SD): 5 patients (age 75 ± 12 yr, 1 M/4F, BMI 25.7 ± 4.1), 2 pts with COPD, 1 with restrictive disease, initial settings: PS 14.6 ± 1,7 cmH₂O, PEEP 6.4 ± 1.5 cmH₂O, NAVA gain 2.8 ± 1.3.

	PS	NAVA	% reduction NAVA vs PS
Td ms	210.4 ± 63.0	51.8 ± 12.1*	74.5 ± 5.0
Ti excess %	12.9 ± 19.6	2.2 ± 0.6	70.8 ± 37.8
n asynchrony/minute	7.6 ± 6.4	4.1 ± 3.7*	47.5 ± 17.0
Respiratory rate min ⁻¹	16.8 ± 2.6	20.4 ± 4.7	NA

* p <0.05

Conclusion: Compared to standard PS, NAVA improves patient ventilator interaction by reducing Td and the overall incidence of asynchrony events. There is also a strong trend in reducing delayed cycling. This ongoing trial should provide evidence that NAVA can indeed improve patient-ventilator synchrony in intubated patients undergoing PS.

Reference

Sinderby C, Navalesi P, et al. Neural control of mechanical ventilation in respiratory failure. Nat Med. 1999;5(12):1433-6.

Extra-vascular lung water and oxygenation index (Horowitz index) in patients with severe sepsis or septic shock

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Aims: To investigate the relationship between impairment of oxygenation (assessed with the oxygenation index, PaO₂/FiO₂ ratio) and extra-vascular lung water index (EVLWI) in patients with severe sepsis or septic shock (sepsis) and compare it with patients who met the diagnosis of acute respiratory distress syndrome (ARDS) or acute heart failure (AHF).

Methods: Between September and December 2006, 204 consecutive ICU-patients (mean age 60.1 years, 41% female) requiring hemodynamic monitoring were included in this observational multi-center study performed in twelve mixed European intensive care units. Sepsis was the underlying disease process in 59%, ARDS in 15%, and AHF in 13% of the patients. Cardiac output (CO), global ejection fraction (GEF), EVLWI and the index of pulmonary vascular permeability (EVLWI/global end-diastolic volume index [GEDVI] ratio) were measured using the trans-thoracic thermodilution technique (PiCCO).

Results: Patients with sepsis and ARDS were younger than those with AHF, had higher CO, GEF and central venous oxygen saturations. In sepsis patients, EVLWI and EVLWI/GEDVI ratio were comparable to those with AHF (9.7 vs 10.9 ml/kg; 1.29 vs 1.11×10^{-2}), whereas both were significantly higher in patients with the clinical diagnosis of ARDS (14.6 ml/kg, $p < 0.001$; 1.96×10^{-2} , $p < 0.001$). The PaO₂/FiO₂ ratio was lowest in ARDS patients (172 ± 88 mm Hg), but did not reach statistical significance compared to sepsis (218 ± 111 mm Hg) and AHF (241 ± 113 mm Hg). A PaO₂/FiO₂ ratio ≤ 200 mm Hg was found in 50% of sepsis patients compared to 69% in ARDS patients ($p = 0.095$), whereas an EVLWI ≥ 12 ml/kg was found in 23% and 47%, respectively ($p = 0.013$). An EVLWI/GEDVI ratio $\geq 1.8 \times 10^{-2}$ was found in 21% and 40% of sepsis and ARDS patients, respectively ($p = 0.034$). Of the patients with AHF, 33% had a PaO₂/FiO₂ ratio ≤ 200 mm Hg ($p = 0.2$ vs sepsis), 27% an EVLWI ≥ 12 ml/kg ($p = 0.8$ vs sepsis) and 11% an EVLWI/GEDVI ratio $\geq 1.8 \times 10^{-2}$ ($p = 0.4$ vs sepsis).

Conclusion: The results of the present data suggest, that, using the PaO₂/FiO₂ ratio only compared to EVLWI and EVLWI/GEDVI ratio, would lead to an overestimation of ARDS in patients with sepsis. Estimation of extra-vascular lung water and of pulmonary vascular permeability may be a better parameter for the diagnosis of ARDS.

Use of B-Type Natriuretic Peptide in the Management of Respiratory Failure in the Critically Ill

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Background: The evaluation and management of patients with acute respiratory failure in the intensive care unit (ICU) is often difficult. The use of plasma B-type natriuretic peptide (BNP), a quantitative marker of heart failure (HF), may be helpful. The purpose of this study was to determine the prevalence of causative disorders of acute respiratory failure in ICU and the impact of a BNP-guided management strategy.

Methods and results: We conducted a prospective, multicenter, randomized, singleblinded, controlled trial of 314 patients with respiratory failure in the ICU. Patients were randomized to a diagnostic strategy with ($n = 159$, BNP group) or without ($n = 155$, control group) the use of plasma BNP levels. Primary endpoints were length and costs of initial hospitalization. BNP assessment, on the top of standard diagnostic strategy, affected the distribution of the adjudicated diagnosis of respiratory failure. BNP measurement resulted in diagnosis of more cases of "HF combined to any additional diagnosis" and revealed that half of ICU patients with the diagnosis of acute respiratory failure had an underlying HF. Hospital length of stay (median, 13 days versus 14 days, $p = 0.50$) and cost of initial hospitalization (median, \$ 6,190 versus \$ 7,155, $p = 0.24$) were however comparable in both BNP and control groups. Predefined subgroup analysis revealed a significant interaction ($p = 0.027$) between the benefit of BNP testing and age with a reduction in cost of initial hospitalization in elderly patients.

Conclusions: Our study revealed that acute respiratory failure is often multi-causal in ICU setting and that concomitant HF was present in many pulmonary diseased ICU patients; BNP-guided strategy did however not affect initial hospital length of stay and costs.

FREE COMMUNICATIONS 3 MEIN PATIENT

Search for optimal blood glucose target in patients with severe traumatic brain injury

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Introduction: Optimal range of arterial blood glucose levels is discussed controversially. While some studies suggest improved outcome, others show signs of impaired cerebral metabolism following severe traumatic brain injury (TBI). Identifying optimal range is essential to avoid inducing secondary brain damage due to hypoglycemia, hyperglycemia, or fluctuating blood glucose levels.

Methods: Search for optimal blood glucose after severe TBI was performed in 3 retrospective studies: 1) in 228 propensity-matched patients subjected to blood glucose targets 3.5–6.5 or 5–8 mmol/l (114 patients each) frequency of hypo- and hyperglycemic episodes, insulin and norepinephrine requirement, and changes in ICP and CPP, mortality and length of ICU stay were investigated. Concentration-dependent influences of arterial blood glucose levels were determined in 2) 69 patients by assessing changes in cerebral metabolic parameters monitored by arterial and jugular venous blood gases within pre-defined blood glucose clusters, ranging from less than 4 to more than 9 mmol/l, and 3) 20 patients using microdialysis to assess changes in cerebral glucose, lactate, and pyruvate.

Results: 1) In patients with low blood glucose levels (3.5–6.5 mmol/l), significant increase in hypo- and hyperglycemic episodes supervened during the 1st week; insulin and norepinephrine requirements were markedly increased. During the 2nd week, incidence of elevated ICP >20 mm Hg and infectious complications were significantly

reduced. 2) Arterial blood glucose concentration- dependently increased brain glucose uptake, decreased lactate production, reduced oxygen consumption, and decreased CO₂ production. At blood glucose levels >8 mmol/l anaerobic glycolysis supervened. Stable brain metabolism was found at arterial glucose between 6 and 8 mmol/l. 3) Arterial blood glucose concentration- dependently and significantly increased brain glucose levels and decreased lactate/pyruvate ratio at arterial glucose between 7 and 9 mmol/l.

Conclusions: 1) Maintaining low arterial glucose levels increases the risk for hypoglycemic episodes and endangers the injured brain. Positive effects are only observed in the 2nd week. 2) Signs of stable cerebral metabolism were observed at arterial blood glucose concentrations between 6 and 8 mmol/l. 3) Investigations including brain microdialysis revealed decreased anaerobic glycolysis at arterial blood glucose levels between 7 and 9 mmol/l.

Can we predict instead of measuring resting energy expenditure in critically ill children? A systematic review

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Introduction: In paediatric intensive care unit, resting energy expenditure (REE) is difficult to assess. Indirect calorimetry remains the gold standard to determine REE but requires personal and financial resources. Predictive equations would be a useful tool but there is a controversy regarding their accuracy. The aim of this systematic review was to examine which predictive equations have been tested

in critically ill children and their accuracy in comparison with indirect calorimetry measurement.

Methods: Studies comparing predicted and measured REE by indirect calorimetry in critically ill children were considered. No limitation of language or date was applied. Children with burns were excluded. The search strategy included electronic searching in Medline, Cochrane, CINAHL and reference list checking.

Results: 13 small single-centre studies, mainly conducted after 2000, met the inclusion criteria. 595 children, 357 boys and 238 girls, with a mean age ranging from 0.4 to 10 years were studied. Most children were ventilated and had medical or surgical diagnosis. 981 indirect calorimetry measurements were performed to assess 14 equations. The formulas of Harris & Benedict, Talbot, White (2), Fleisch and WHO/FAO/UNU are clearly inaccurate. Caldwell-Kennedy, Maffei, Kleiber and Hunter were assessed by two studies and the Mayo Clinic equation and the Dreyer equation by only one study, all were also inappropriate. For the two equations of Schofield, the one with weight and height and the one with weight, results are divergent among studies. Statistical analyses differed broadly between studies and the Bland-Altman method was not always used making the comparison difficult. 4 studies provided results per subgroup, but different analyses were performed, i.e. age, diagnosis or type of respiratory support.

Conclusion: This systematic review shows that predictive equations should not be used in ventilated critically ill children except Schofield equations that require further investigations. A consensus is needed to express the results of REE. Indirect calorimetry remains the most accurate method.

Impact of short fish oil infusions on cell membrane composition and ICU outcome in patients undergoing coronary artery bypass surgery: preliminary data

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Rationale: FO is known to blunt inflammatory responses and to reduce arrhythmias. In healthy volunteers a single short 0.2 g/kg intravenous fish oil (FO) infusion causes a significant incorporation of EPA/DHA in the platelets membranes and blunts response to endotoxin. Cardiac surgery patients exhibit a strong inflammatory response and suffer postoperative arrhythmias. The aim of the study is to test if short infusion of FO modifies platelet and cardiomyocytes membrane composition, and clinical course of patients undergoing elective coronary artery bypass surgery.

Methods: Patients were randomised to receive a 3 x 2 hours 0.2 g/kg FO emulsion infusion (Omegaven[®], Fresenius Kabi) or placebo. Timing of infusion: evening before (T1), at premedication (T3) and immediately after surgery (T6). Blood samples: before and after (T2, T4, T7) each FO infusion and on morning after surgery (T8). During surgery, the excised auricle was held for analysis. Determination of triglycerides (TG) plasma concentration (safety), platelets & cardiomyocytes membranes fatty acid (FA) composition as % molar weight of total FA. Severity of illness scores (SIS): EUROscore APACHE II, SAPSII, SOFA. ICU outcome: peroperative bleeding, duration of mechanical ventilation, ICU stay.

Statistics: mean ± SD, two-way ANOVA, Wilcoxon signed rank.

Results: Twelve patients aged 69 ± 11 years (out of 40 planned) were enrolled. Plasma TG concentration increased after infusions (2.6 to max 8 mmol/L) and reverted to pre-infusion levels before next FO infusion reverting. Membrane composition data available in 7 patients. A significant EPA incorporation was found in platelets (table) and cardiomyocytes (p < 0.05). Length of ICU stay, duration of mechanical ventilation, SIS and peroperative bleeding did not differ between groups.

Allocation	Plasma TG (mmol/L)		Platelet EPA (%)		Platelet DHA (%)	
	Control	FO	Control	FO	Control	FO
T2	1.5 ± 0.48	4.73 ± 1.38*	0.37 ± 0.12	0.43 ± -0.08	1.97 ± 0.51	2.13 ± 0.51
T4	1.4 ± 0.17	4.30 ± 1.4*	0.33 ± 0.11	0.84 ± -0.47	2.06 ± 0.49	2.38 ± 0.86
T8	0.85 ± 0.3	0.81 ± 0.25	0.20 ± 0.18	1.30 ± 0.25*\$	2.02 ± 0.59	2.36 ± 1.02

*: p < 0.05 versus control, \$. P < 0.05, T1 versus T8

Conclusion: Significant incorporation of EPA in cardiomyocytes was observed after 2 perfusions and the EPA in platelets after 3 perfusions: the TG peak stays in safe ranges. No change in clinical outcome was detected at this early stage of the study, but the infusions appeared safe in absence of any change in bleeding or persistent hypertriglyceridemia.

Renal Perfusion Quantification With Contrast Echography

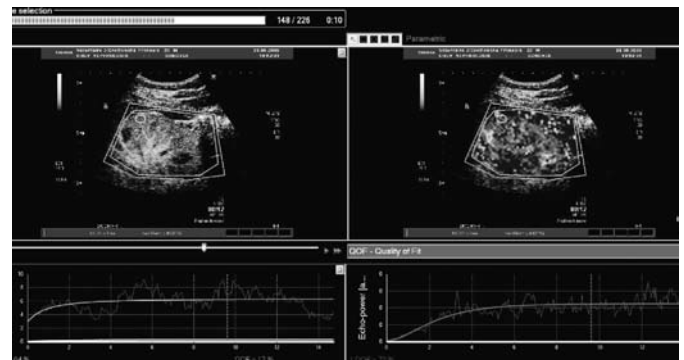
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Introduction: Acute kidney injury is a major concern in the intensive care unit because of its frequency and association with a high mortality. In clinical practice, renal function is mainly assessed by serum creatinin and urinary output. As renal function is closely linked to perfusion, quantification and follow-up of this parameter could be of great importance. However, in the Intensive Care Unit, no current technique allows its evaluation. Contrast-enhanced echography is a fast and safe imaging method, already used to quantify blood flow in various organs such as myocardium and brain. The aim of this study was to evaluate the ability of contrast echography to detect changes in renal perfusion in healthy volunteers.

Methods: Renal contrast echography was performed on 12 healthy subjects during infusion of 0.7 ml/min of SonoVue[®]. Destruction / Refilling sequences were obtained at baseline (T0), during infusion of Angiotensin II (ATII) at 1 ng/kg/min (T1), at 3 ng/kg/min (T2) and 1 hour after an oral dose of 50 mg of captopril (T3). Serial PAH clearance calculations were performed in parallel (T0, T1, T2 and T3). DICOM clips were acquired and analysed with a dedicated software allowing measurement of Relative Blood Flow and Mean Transit Time. These two parameters were further used to derive a Perfusion Index (PI). Analyses were performed in several regions of interest excluding renal arcuate arteries. Different PI were ultimately compared within one patient and correlated with PAH clearance measurements.

Results: SonoVue[®] infusions were well tolerated by all subjects. No modification in blood pressure was noted neither with low dose ATII infusion nor after oral captopril intake. An increase in systolic blood pressure of 15–20 mm Hg was recorded during high dose ATII infusion. A dose-dependent decrease in PI was observed following infusion of Angiotensin II. An increase in PI was noticed after captopril. These changes occurred within minutes. PAH clearance data were determined at the various time points (T0, T1, T2 and T3). The complete statistical evaluation is in progress at the time of submission of this abstract.

Conclusion: Contrast echography could become a simple and reliable method to assess renal perfusion. This approach is ideally suited for intensive care patients since the procedure is fast and easily applicable at bedside. Following this protocol, more studies will be performed in acutely ill patients in order to further validate this approach.



Forschungsprojekt: Schmerzmanagement

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Hintergrund: Internationale Studien zeigen, dass Pflegenden nicht selten Wissenslücken in Bezug auf ein angepasstes und effektives Schmerzmanagement aufweisen. Im Rahmen des Studiengangs Bachelor of Science in Nursing an der WE'G Hochschule Gesundheit wurde das Forschungsprojekt «Schmerzmanagement» durchgeführt. Es handelt sich um eine quantitative Untersuchung von Intensivstationen, Notfallstationen und Onkologiestationen, die zu ihrem Wissen und Einstellung beim Schmerzmanagement befragt wurden (n = 319). Im Poster werden die Ergebnisse der Pflegenden von zwei interdisziplinären Intensivstationen (n = 68) in Vergleich mit dem Gesamtscore gesetzt.

Methoden: Es wurde eine deskriptive Forschung mit einem Querschnittsdesign eingesetzt. Die Daten wurden mit Hilfe des Fragebogens von Ferrel & McCaffery (Nurses' Knowledge and Attitudes Regarding Pain & "NKAS", 1997) gesammelt, bei dem es sich um das am häufigsten verwendete Instrument zur Erfassung von

Wissen und Einstellung der Pflegenden handelt. Gleichzeitig wurden soziodemographische Daten und arbeitsspezifische Informationen erfasst. Die Übersetzung und der Pretest fanden durch Gugler (2005) statt. Der Befragungszeitraum lag bei 4–6 Wochen im Sommer 2008. Die Rücklaufquote betrug 63% (Intensivstationen 70%). Die statistische Auswertung wurde mit dem SPSS 16 durchgeführt.

Resultate: Es konnten maximal 39 Punkte erreicht werden (Gesamt: 27,8 Punkte, Intensiv: 27,4 Punkte). Der einzelne Wissensstand ist jedoch sehr unterschiedlich (Intensiv: 2,8 bis 39 Punkte). Es bestehen deutliche Wissenslücken in der Pharmakologie; der Mythos Atemdepression bei Morphindosierhöhung hält sich weiterhin (Gesamt: 62%, Intensiv: 75%). Obwohl die Pflegenden die vom Patienten eingeschätzte Schmerzintensität als die Verlässlichste angeben

(Gesamt: 96%, Intensiv: 84%), werden sie durch das Verhalten beeinflusst. So wird beim lächelnden Patienten die Schmerzreserve weniger oft ausgeschöpft als beim nicht lächelnden (Intensiv: 40 vs. 46%). Ausserdem geben knapp 39% aller Pflegenden an, dass der Patient die Schmerzen übertreibt.

Schlussfolgerungen: Um Nachhaltigkeit zu erreichen, sind regelmässige, interdisziplinäre Schulungen notwendig. Dabei soll die medikamentöse, wie auch die nicht-medikamentöse Therapie gewichtet werden.

Mit Fallbesprechungen auf den Stationen zu individuellen Praxis-situationen soll eine Sensibilisierung und Gewährleistung der Schmerzeinschätzung und adäquaten Behandlung sichergestellt werden.

FREE COMMUNICATIONS 4 DER ZEREBRALE KREISLAUF

Preoperative mapping of arterial spinal supply in patients with thoracoabdominal aortic aneurysm using MRA with Vasovist (gadofosveset trisodium) at 3 Tesla: Preliminary Experience

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Introduction: Preoperative mapping of the arterial spinal supply prior to thoracoabdominal aortic aneurysm repair is crucial because of an up to 5% risk of postoperative ischemic spinal cord injuries such as paraparesis or paraplegia. Preoperative localization of the arterial spinal cord supply including the Adamkiewicz artery and its supplying segmental artery may enable planning of surgery and reduce postoperative ischemic complications.

Methods: Ten consecutive patients prior to surgical thoracoabdominal aortic aneurysm repair were investigated. All patients underwent MR angiography (MRA) of the spinal vasculature using a 3-Tesla MRI scanner (MAGNETOM Verio 3T, Siemens, Erlangen, Germany). The sequence applied was a steady state coronar 3D FLASH MRA with 0.7-mm isotropic voxels. MRA was performed injecting 0.12 ml/kg/body weight Vasovist (gadofosveset trisodium, Bayer Schering, Berlin, Germany) at 2 ml/sec. Images were evaluated using postprocessing with MPR and MIP and arterial spinal supply including the Adamkiewicz artery and its segmental artery was mapped from aortic origin to the spinal canal entry.

Results: Identification and localization of the Adamkiewicz artery and its segmental artery as major arterial spinal supply was successful in all patients including the level of aortic origin and spinal canal entry. All patients underwent surgery for thoracoabdominal aortic aneurysm repair and no clinical postoperative ischemic sequelae occurred.

Conclusions: Non-invasive preoperative mapping of arterial spinal supply was successful in all patients prior to surgical thoracoabdominal aortic aneurysm repair. The use of 3-Tesla MRA with Vasovist-enhancement enables identification and localization of the Adamkiewicz artery and its segmental artery with regard to the level of aortic origin and spinal canal entry.

Laboratory in-vivo evaluation of the Phenox CRC for mechanical thrombectomy in acute stroke

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Introduction: The purpose of this study was to evaluate the efficiency, thrombus-device interaction and potential complications of the novel Phenox CRC (Clot retriever CAGE) for distal mechanical thrombectomy in acute vessel occlusion.

Methods: The device was evaluated in an established animal model for acute stroke. Recanalisation rate, thromboembolic events, vasospasm and complications were assessed. Radio-opaque thrombi (2 cm length) were used for the visualization of thrombus-device

interaction during retrieval. The Phenox CRC (4 mm diameter) was assessed in 15 vessel occlusions. For every occlusion a maximum of 3 retrieval attempts were performed.

Results: Thrombus-device interaction illustrated the entrapment of the thrombus by the microfilaments and the proximal cage of the device. No significant thrombus compression was observed. No vessel perforation, dissection nor fracture of the device occurred. Complete recanalisation (TIMI 3) was achieved in 86.7% of vessel occlusions. In 66.7% (10/15), the first retrieval attempt was successful, in 20% (3/15) the second attempt led to complete recanalisation of the parent artery. In two cases (13.3%) thrombus retrieval was not successful (TIMI 0). In one case (6.7%) a minor embolic event occurred into a proximal side branch. No distal thromboembolic event was observed during the study.

Conclusion: The Phenox CRC clot retriever is a safe and effective distal device for thromboembolectomy in-vivo. The unique design with a combination of microfilaments and proximal cage reduces thrombus compression with a consequently high recanalisation and low complication rate.

Stereolithographic Models for Advanced Treatment Planning in EC-IC Bypass Surgery for Complex Giant Aneurysm

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Introduction: Treatment of large intracranial aneurysms requires a strategic preoperative planning. Despite modern 3D rotational angiography and CT-angiography, there may be complex configurations where a true 3D model may improve visualization and decision making. We evaluated the potential of a novel technique of 3D-stereolithographic models (rapid prototyping) and describe the use of these techniques for surgical planning and intraoperative orientation in patients with complex giant aneurysm treated with extracranial to intracranial (EC-IC) bypass surgery.

Methods: Preoperative planning was performed using CT, CT-angiography (CTA), 3D-rotational angiography (3D-RA) and MRI. Based on a CTA and 3D-RA, relevant anatomical structures such as the shape and extend of the aneurysm, thrombosis, vascular implants of a previous surgery or endovascular intervention as well as the courses of target and donor vessels were defined. The 3D-stereolithographic model integrated these structures within a 3D object.

Results: In four patients with complex giant aneurysms (3 MCA, 1 PCA), all previously treated with stents, coils or clips, the 3D-remodeling could be adequately achieved using CTA and 3D-RA. In all cases the model fulfilled the requirement of the vascular neurosurgeons and neuroradiologist for optimal 3D assessment of the relevant structures down to an object size of 1 mm. Hence, the 3D model helped to understand the complex anatomical configuration.

Conclusion: Precise representation of the spatial relationships between anatomic structures is particularly useful for the pre-operative planning of the EC-IC bypass surgery for the access and in-trap-

erative orientation in complex giant aneurysms. The use of 3D-stereolithographic model technique may help to better visualize this complex configuration in large or giant aneurysms especially when previously treated with clips or coils.

Toxicity of tPA after middle cerebral artery occlusion in wild type and matrix metalloproteinase-9 deficient mice

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Thrombolysis with tissue plasminogen activator (tPA) is the only treatment after embolic stroke. However, it has been suggested that tPA may have neurotoxic effects due to exacerbation of the NMDA receptor response and increase of the matrix metalloproteinase-9 (MMP9) activity. We have previously shown that cerebral ischemia induces overexpression of MMP9 and that MMP9 plays a significant role in blood brain barrier (BBB) disruption leading to cerebral edema and hemorrhagic transformation. Therefore, it is questionable whether the action of tPA in stroke worsens the effects of an already high level of ischemia-induced MMP9. In order to address this question, we treated wild type (WT) and MMP9 knockout (KO) mice with tPA after 90 minutes of intraluminal middle cerebral artery occlusion and analyzed mortality rate, BBB disruption (Evans blue extravasation), microvessel injury (collagen and laminin loss), brain edema and cerebral infarct 24 h after reperfusion. In WT, tPA treatment increased the mortality to 44% (n = 9) as compared to 36% without treatment (n = 11). The mortality rate remained at 33% in treated and non-treated KO (n = 18). Cerebral infarct volumes were 42.6 mm³ and 22.7 mm³ in treated and non-treated WT, and 25.9 mm³ and 25.5 mm³ in treated and non-treated KO. Hemispheric enlargement was 35% in treated WT as compared to 12% in non-treated WT, and 17% in treated KO as compared to 12% in non-treated KO. Collagen and laminin loss were 57% and 56%, respectively, in treated WT as compared to 39% and 36% in non-treated WT, and 41% and 47%, respectively, in treated KO as compared to 38% and 43% in non-treated KO. The intensity of EB extravasation was increased by 2.3 after tPA treatment in WT and was not modified in KO. These results show a trend toward higher tPA toxicity in wild type mice as compared to MMP9 deficient mice after 90 minutes middle cerebral artery occlusion and support the hypothesis that deleterious effects of MMP9 are exacerbated by tPA treatment after stroke. Larger cohorts of animals should allow to confirm these promising preliminary results.

Mid-term Results of Drug-eluting Stent Placement in the Treatment of Intracranial and Extracranial Stenoses

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Introduction: The introduction of drug-eluting stents (DES) in the treatment of coronary artery stenosis has led to a reduction of the restenosis rate. Currently, there is only limited experience about the use of DES in stenosis of brain supplying vessels, which may reduce the rate of ischemic events in the extracranial and intracranial circulation by preventing restenosis. We evaluated retrospectively the feasibility and effectiveness of DES stent placement in the treatment of intracranial and extracranial high-grade stenosis.

Material and methods: Twelve patients (10 men, 2 women, mean age 55.2 yrs) with high-grade stenosis of brain supplying vessels were treated with 13 DES. Eleven patients were symptomatic due to stroke or TIA and one patient was asymptomatic. Distribution of the lesions was as follows: vertebral artery in 6 cases, medial cerebral artery in 3, common carotid artery in one, internal carotid artery in one and basilar artery in one case. DES used were: 3 Taxus Express II, one Xience V, one Promus, 7 Endeavor RX, one Cypher Select. All patients underwent clinical and imaging follow-up using MRI and/or TCD. The follow-up period ranges from 3 to 42 months.

Results: Technical success could be achieved in all lesions. There was neither procedure related morbidity nor mortality. One patient died during the hospitalisation due to an intracerebral hemorrhage not related to the stent treatment. Follow-up was available in all eleven surviving patients. All patients showed stabilisation or improvement of the preprocedural symptoms during follow-up. In one patient an asymptomatic 50% restenosis occurred after 42 months. In all the other patients no significant restenosis could be detected.

Conclusion: The application of DES in extracranial and intracranial high-grade stenosis is feasible with a high technical success rate and low complication rate. The mid-term restenosis rates at follow-up are encouraging, but need further long-term investigation as delayed endothelialization leading to late restenosis may occur.

POSTERS

SESSION 1 – DER HIRNKRANKE PATIENT

Factors influencing recurrence in chronic subdural hematoma

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Chronic subdural hematoma (cSDH) is a common diagnosis in neurosurgery. However, recurrences requiring repeat surgery are observed in 15 to 20% of case. With this retrospective analysis of patients we searched for possible factors influencing the likelihood for recurrences in order to identify factors that might be influenced by surgical technique or management.

Methods: Ninety-eight patients treated for cSDH at our department between July 2006 and July 2007 formed the basis of this analysis. Patient history, symptoms, age, anticoagulation therapy, bilateral vs. unilateral location, pre- and postoperative blood coagulation studies, thrombocyte cell count, the number of burr holes and the amount of rinsing fluid as derived from OR protocols (rather than surgeon's notes) were recorded. SPSS 15.0 was used for statistical review.

Results: Average age was 70 years. Of 98 patients 16 suffered recurrences and were reoperated (16.3%). 20 patients had bilateral cSDH (20.4%), 22 patients were anticoagulated with phenprocoumon (n = 20.4%), 12 patients received antithrombotic therapy (22.4%). In 54 patients had knowledge of prior head trauma (55.1%), whereas the others did not. In patients without recurrence the volume of rinsing fluid was 1414.5 ± 447 ml and 1212.5 ± 429.77 ml (n.s.). In multivariate nominal regression analysis however, the volume of rinsing fluid was a significant, independent predictor of recurrence (p = 0.005),

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as were age (p = 0.02), bilateral location (p = 0.044) and antithrombotic therapy (p = 0.047).

Conclusion: Our data demonstrate that rinsing volume is a significant and independent factor determining recurrence in cSDH. This factor may be directly influenced by the treating surgeon.

Continuous intravenous glutamine infusion does not increase plasma or brain glutamate in patients with severe traumatic brain injury

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Introduction: Critically ill patients suffer from glutamine (GLN) deficit associated with increased morbidity and mortality. Consequently, modern intensive care medicine includes GLN administration to correct this deficiency and to ameliorate GLN-dependent cytoprotection. GLN is transformed enzymatically to glutamate (GLU). GLU, in turn, is feared for its excitotoxic potential following traumatic brain injury (TBI). Thus, GLN was not administered after TBI. Recently published data showed that GLN (0.34 g/kg/20 h) does not increase plasma and cerebral GLU. The present pilot study was designed to investigate the effects of a higher GLN dose infused at 0.5 g/kg/24 h, corresponding to Alanine (ALA)-GLN 0.71 g/kg (Dipeptiven®) after severe TBI.

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Methods: In 6 TBI patients, pharmacokinetic and pharmacodynamic investigations were performed including analysis of: arterial and jugular venous plasma amino acids at pre-defined time points by HPLC, cerebral glutamate, lactate, glucose, pyruvate by microdialysis, SjvO₂ in jugular venous blood gas analysis, EEG activity using BIS EEG®, ICP, and CPP. The multitude of parameters is important to exclude indirect signs of worsening which are not directly unmasked by changes in GLU. All patients received ALA-GLN (Dipeptiven®) at 0.71 g/kg for 24 hours. For basic enteral nutrition via a jejunal tube all patients received Fresubin® energy fibre; its dose was adjusted to indirect calorimetry performed before GLN infusion. Control plasma and microdialysis samples were drawn before infusion start and up to 24 hours following GLN infusion.

Results: Infusing ALA-GLN at a higher dose increased plasma GLN by approx. 50% without reaching normal values. Within 1 hour after stopping GLN infusion plasma GLN levels returned to baseline values. GLU was not increased in plasma or brain at any time point. In addition, signs of cerebral metabolic impairment, increased neuronal activity, or elevated ICP were also not observed.

Conclusions: Continuous intravenous infusion of ALA-GLN (Dipeptiven®) at 0.71 g/kg, corresponding to GLN 0.5 g/kg for 24 hours neither increased GLU concentrations nor impaired cerebral metabolism. Thus, GLN can safely be infused in patients with severe TBI. Further investigations are required to assess the impact of prolonged GLN infusion in these patients. A dose-escalation study is also needed to determine the GLN dose required to normalize plasma GLN concentrations without increasing GLU levels.

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Intraoperative template molded bone flaps

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Introduction: Removal of the bone flap and cranioplasty is mandatory in case of intraosseous tumor manifestation or in primary or secondary infections of the brain, meninges, or skull bone. Intraoperative molding of polymethyl-methacrylate (PMMA) into complex three-dimensional shapes with correct thickness is often a time consuming process and may lead to unsatisfying cosmetic results. Various computer aided prefabricated patient-specific implants (PSI) have been developed to address this disadvantages. Such implants are associated with long production times and high costs.

Methods: A total of 17 consecutive patients undergoing cranioplasty due to tumor, infectious or traumatic skull bone defects from September 2008 – April 2009 were included in this study. We employed a simple cost and time-efficient technique to mold PMMA into a PSI for either immediate or delayed cranioplasty. The bone flap served as a cast to mold a negative form. In between this template and the original bone flap the definite implant was created under gentle pressure until preferred thickness is achieved. A smooth foil or oil between each layer prevents adhesion. Infectious bone flaps were autoclaved and packed up in sterile bags.

Results: Most of the patients required cranioplasty due to infection (n = 10, primary infection in 2, secondary infection in 8 patients). Five and two patients were operated in consequence of tumors and trauma, respectively. Clinical and radiological follow-up were performed 2 to 3 months after surgery and included routine CT-scan and 3D reconstruction in selected cases. The duration of the molding procedure was 20.6 ± 4.2 minutes. The size of cranioplasty was 50.4 ± 24.4 cm² (range: 27.4–105.6 cm²). The aesthetical outcomes were considered “excellent” in 14 patients and “good” in three patients. In one patient the molded cranioplasty had to be removed due to delayed meningitis unrelated to the primary infection.

Conclusion: The results of this study demonstrate that the performed – patient specific template molded bone flap – cranioplasty approach provides a feasible, fast, and inexpensive technique with excellent cosmetic outcome. The molding method is safe and can be applied in early and delayed cranioplasty procedures of large and complex skull defects. In selected patients (mainly tumor patients) immediate single stage reconstruction avoids a second operation.

Treatment strategies for recurrent Glioblastoma multiforme: The impact of resection, Implantation of Carmustine wafers and intensified alkylating chemotherapy

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Objective: Due to the primary treatment of patients with Glioblastoma multiforme (GBM) with alkylating drugs (AD) the role of a rechallenge with AD upon recurrence is subject to discussion. In addition, the pivotal role of cytoreductive surgery for GBM, as demonstrated for the primary treatment, has not yet been evaluated for recurrent GBM. We therefore investigated the role of re-resection and intensified alkylating chemotherapy by both local and systemic regimens in a single institution series of patients with radiographic recurrence of GBM, stratified for MGMT-status.

Method: Since 12-2006 31 subsequent patients with recurrent GBM under Stupp regimen were included after informed consent was obtained. Patients were subject to re-resection, implantation of carmustin wafers and were treated with temozolomide one week on/ one week off (150 mg/m²/BS), 4 weeks after surgical treatment. Patients were evaluated pre- and postoperatively by Karnofsky-, Barthel- and the NIH-Score and serial MR-images (all parameters were collected presurgical, <72 h after surgery and every 3 months). Toxicity was closely monitored every week. Overall survival (OAS) and progression free survival (PFS; McDonald criteria) were determined after 3 months (PFS-3). The MGMT-promoter status was determined by methylation specific PCR.

Results: 89% had a near complete resection with less than 5 ml residual tumor volume. Severe toxicity after WHO CTC was observed in 19 patients [Grade 3 (n = 13) and 4 (n = 6)]. All patients demonstrated a decreased Karnofsky- and NIH-Score immediately postoperatively, which stabilized until disease progression and even improved after 6 months. As yet, the median PFS is 12 weeks and median OAS 18.9 months (first diagnosis to death). 75% of the patients were MGMT negative. The OAS for these patients with a positive MGMT-status was 19.6 months, with a negative status 17.5 months.

Conclusion: As yet, there are no data on the prognosis of patients with a recurrent GBM after Stupp, but the untreated clinical course is associated with a dismal prognosis. The high percentage of MGMT-negative patients probably reflects a negative selection bias, due to the consecutive inclusion of recurrent patients in a single centre study. However, the OAS demonstrated in our population compares favourable with the OAS of the MGMT negative subpopulation published by Hegi (20/12.7 months). Though the toxicity of this regimen is without severe adverse events.

04

Endoscopic third ventriculostomy and biopsy for third ventricular and pineal region tumors

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Introduction: Lesions in the pineal region and the posterior part of the third ventricle commonly cause symptoms of obstructive hydrocephalus and compression of the tectal midbrain. Direct surgical access to obtain a tissue sample for diagnosis requires a substantial surgery. Stereotactic biopsy is plagued with morbidity due to the proximity of the deep cerebral veins as well as tissue heterogeneity and subsequent sampling error.

Methods: A small series of four patients with pineal region tumors, tumors of the posterior third ventricle or its walls are presented. All patients underwent successful endoscopic third ventriculostomy to address the presenting and threatening condition of obstructive hydrocephalus. At the same procedure an endoscopic biopsy was obtained. Using the rigid neuroendoscope and placement of the burrhole 4 cm off the midline and 11 cm posterior to theinion the direction of the endoscope allowed for both the ventriculostomy AND the biopsy to be performed in the same setting without need for a second burrhole.

Results: All four patients tolerated the procedure without complications. Signs of raised intracranial pressure subsequent to hydrocephalus resolved quickly. All patients had a blocked external ventricular drain which could be removed with 1–3 days. An small but adequate sample of tumor tissue could be obtained in three cases. The diagnoses were non-germinomatous germ cell tumor, pineoblastoma, glioblastoma in three patients respectively. The fourth patient had a cystic thalamo-mesencephalic tumor. The cyst was entered with the endoscope and drained into the ventricular system. The

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tissue sample in this case was too small to ascertain a diagnosis other than "glioma". This patient underwent a second stereotactic biopsy which yielded sufficient tissue for the diagnosis of glioblastoma.

Conclusion: The modified access frontal endoscopic third ventriculostomy with placement of the burrhole 1 cm in front and 1 cm lateral to Kocher's point provides for sufficient angulation of the endoscope to perform both the ventriculostomy and a biopsy from the third ventricular mass at the same setting with out the need for more than one burrhole.

The "Lund Concept" for the treatment of severe head trauma in a Swiss Tertiary Intensive Care Unit: Four Years Experience

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Introduction: The Lund Concept is an approach to the treatment of severe brain trauma. It is mainly based on hypotheses originating from basic physiological principles regarding brain volume and cerebral perfusion regulation. The therapy has two main goals: (1) to reduce or prevent an increase in ICP (ICP-targeted goal) and (2) to improve perfusion and oxygenation around contusions (perfusion-targeted goal). Improving perfusion and oxygenation is achieved by normal blood oxygenation, by maintaining normovolaemia with normal haematocrit and plasma protein concentrations, and by antagonizing vasoconstriction through reduction of catecholamine concentration in plasma and sympathetic discharge (minimizing stress and by refraining from vasoconstrictors and active cooling).

Methods: Sixty-two patients with severe brain trauma were admitted to the surgical intensive care unit between January 2005 and December 2008. All patients got a standardized therapy based on the therapeutic goals of the Lund Concept. General and demographic data, neurological data (GCS, AISh, ICP), type and need of neurosurgical intervention, pharmaceutical therapy, amount of blood products, need and use of rescue therapy, complications, ICU and hospital mortality were investigated in a retrospective analysis.

Results and conclusions: The study is an analysis of a standardized therapy focusing on prevention and treatment of vasogenic oedema in patients suffering severe TBI over a period of four years (Lund Therapy). The data analysis is at the date of the abstract submission deadline in progress and the complete set of data will be presented at the poster session of the 2009 Congress of the Swiss Society of Intensive Care Medicine on 24.–26. September 2009.

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The "Lund Concept" for the treatment of severe head trauma in a Swiss Tertiary Intensive Care Unit: Outcome analysis and clinical follow-up

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Introduction: Traumatic brain injury (TBI) is a leading cause of death and disability. A reliable prediction of outcome on admission is of great clinical relevance. This study evaluated the outcome of treatment according to the Lund concept in patients with severe traumatic brain injury. The study had two main goals: (1) to investigate whether the present goals of the protocol were achieved and (2) to develop prognostic models using baseline characteristics to provide adequate discrimination between patients with good and poor 6 months outcomes after TBI.

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Methods: Sixty-two patients with severe brain trauma were admitted to the Surgical Intensive Care Unit between January 2005 and December 2008. Treatment has been performed according to the principles of the Lund concept. General and demographic data, neurological data (GCS, AISh, ICP), type and need of neurosurgical intervention, pharmaceutical therapy, amount of blood products, need and use of rescue therapy, complications, ICU and hospital mortality were investigated. The mean clinical follow-up was 27 months (range 5–53). Parameters available at admission were considered in logistic regression models to predict mortality and unfavourable outcome according to the GCS at 6 months after injury.

Results and conclusions: The study is an analysis of a standardized therapy focusing on prevention and treatment of vasogenic oedema in patients suffering severe TBI over a period of four years. The data analysis is at the date of the abstract submission deadline in progress and the complete set of data will be presented at the poster session of the 2009 Congress of the Swiss Society of Neurosurgery.

Endovascular treatment of a traumatic direct carotid-cavernosus fistula using the Amplatzer Vascular Plug II

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Introduction: Vascular Plug devices are successfully used in cardiopulmonary and peripheral interventions to occlude high-flow lesions. The Amplatzer Vascular Plug (AVP) type I has been adapted clinically for the treatment of high-flow lesions and parent artery occlusion in neurointerventions including sacrifice of large cervical vessels in aneurysm treatment and in the treatment of arteriovenous fistulas. The Amplatzer Vascular Plug II (AVP II; AGA Medical Corporation, Golden Valley, USA) is a new generation, cylindrical, self-expandable, re-sheathable, nitinol wire mesh consisting of three lobes leading to flow turbulence and stimulating fast clot formation in the plug. We report the first clinical case of carotid artery occlusion using the new generation AVP II for the treatment of a carotid-cavernous fistula (CCF).

Case report: A 32-year old man was referred after incomplete endovascular treatment elsewhere of a CCF type A on the right side after a car accident 4 years ago with aneurysmatic dilatation of the sinus cavernosus and venous drainage through the inferior and superior petrosal sinus. There was no perfusion of the intracranial circulation through the ICA and parent artery occlusion was indicated. Carotid and vertebral angiography showed spontaneous crossflow to the right distal ICA. One AVP II (6x6 mm) was deployed in the petrous segment of the ICA through a 7F guiding catheter (Guider, Boston Scientific, Natick, USA). Post-deployment angiogram showed significant reduction of flow. Repeated control angiographies revealed minimal residual flow after 15 minutes. Therefore, one additional AVP I (6x6 mm) was deployed proximally to the AVP II resulting in complete flow cessation within one minute. Neither residual proximal nor distal inflow from the contralateral side to the fistula was seen. There were no postinterventional complications.

Discussion: The AVP II can be adapted for the treatment of high-flow lesions by parent artery occlusion in head and neck interventions. It may offer an additional tool or alternative to established balloon and coil devices. Its application in this case was uncomplicated, safe and effective. Deployment of several devices may be needed in case of high flow fistulas to avoid delayed cessation of flow, which may carry the risk of thromboembolic events.

Conclusion: Endovascular carotid artery occlusion using the AVP II seems to be uncomplicated, safe and effective.

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Carotid plaque volume is a predictor of ipsilateral hemispheric ischemic lesions: a 3 Tesla MRI study

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Background: Recent data suggest that histological composition of the carotid atherosclerotic plaque (CAP) can predict the risk of ipsilateral ischemic stroke. We used 3 Tesla MRI to assess the association between the CAP volume and the amount and the total volume of ipsilateral hemispheric ischemic lesions (IHIL).

Methods: The MRI protocol included T1-, T2- and TOF-images of the carotid bifurcation, and FLAIR images of the brain. Semi-automated volumetric analysis was used to determine CAP volume and the amount and the total volume of IHIL on the axial FLAIR images. The presence of intra-plaque hemorrhage, thin or disrupted fibrous cap, large lipid core, and calcification of the CAP was also correlated with the amount and the total volume of IHIL.

Results: 21 patients with a total of 34 CAPs were prospectively included. There were 9 high-grade (>70% according to NASCET criteria), 12 moderate-grade (50–69%), and 13 lower-grade (<50%) stenoses of the internal carotid artery (ICA). 6 patients had a recently symptomatic ICA stenosis. The CAP volume was significantly correlated with both the total volume and the amount of IHIL ($r = 0.38$; $p = 0.02$ and $r = 0.33$; $p = 0.05$, respectively). There was a significant correlation between the presence of calcification in CAP and the total volume of IHIL ($r = 0.36$; $p = 0.02$). Neither the degree of stenosis, nor other plaque morphology features were correlated to the amount or the volume of IHIL. The amount and the volume of IHIL did not differ between symptomatic and asymptomatic patients.

Conclusions: The volume of the carotid plaque and the presence of calcifications were significant predictors of ipsilateral hemispheric ischemic lesions in this study.

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Correlation between FET-PET and intraoperative 5-ALA guided biopsies in gliomas

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Objective: The purpose of this study was to determine the relationship of [18F]fluoroethyl-L-tyrosine (FET) uptake in gliomas using PET and intraoperative 5-aminolevulinic acid (5-ALA) fluorescence using neuronavigated biopsies during resection as a reference. FET PET provides improved imaging of tumor extent compared with MRI and 5-ALA fluorescence is used as intraoperative marker for the identification of tumor tissue.

Methods: FET-PET was performed in 30 consecutive patients with intracerebral lesions suggestive of diffuse gliomas on MRI. Areas of FET uptake with a lesion/brain ratio >1.6 were considered as tumor positive. FET-PET data were coregistered with MRI data before surgery in order to provide optimal guidance of neuronavigated biopsies during resection. Intraoperatively, neuronavigated biopsies were taken from various FET positive areas and checked for tumor fluorescence after application of 5-aminolevulinic acid (5-ALA). Additionally, a number of specimen were taken from 5-ALA positive tissue that showed no FET-uptake in PET.

Results: 13 of 30 tumors were diagnosed as low-grade gliomas (WHO grade II), 15 as anaplastic glioma (WHO grade III) and 2 as glioblastoma multiforme. A match of FET-pos/ALA-pos biopsies was found in 70.6% (12/17) of high-grade gliomas (WHO grade III/IV) but only in 7.7% (1/13) of low grade gliomas. FET-neg/ALA-neg biopsies yielded a low-grade tumor in 46.2% (6/13) and a high-grade glioma in 11.8% (2/17). A mismatch between FET uptake and 5-ALA (FET-pos/ALA-neg) was found in 46.2% (6/13) of the low-grade and in 17.6% (3/17) of the high-grade tumors. The combination of FET-PET and 5-ALA-positivity yielded a sensitivity for high-grade gliomas of 70.6% and a specificity of 94.4%.

Conclusion: In high-grade gliomas increased FET-uptake is related to 5-ALA fluorescence in most cases so that FET PET may be considered as a surrogate marker for planning of 5-ALA guided tumor resection. In low-grade gliomas, however, there is a pronounced discrepancy between FET-uptake and 5-ALA fluorescence. This appears to be mainly caused by the inability of 5-ALA to accumulate in tumor areas with intact blood-brain barrier in contrast to FET.

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Functional Organization of the Primary Motor Cortex in Congenital Paraplegic Patients

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Introduction: In congenital chronic paraplegic patients with myelomeningocele (MMC) only little is known about the functional organization of the primary motor cortex (M1). The neural tube defect in myelodysplastic patients occurs between the 21st and 28th day of embryonic development and is typically associated with dysplastic changes in the brain and with hydrocephalus. This is the first study to assess the somatotopic organization of M1 in MMC patients using fMRI.

Material and methods: Ten right-handed MMC patients with complete paraplegia (ASIA-Score grade A) due to thoracic spinal lesions underwent standardized BOLD-fMRI (executed tongue and finger movements, imagined foot movements) at 1.5 T or 3.0 T to study M1-somatotomy. Patient data were processed and evaluated on an individual basis using BrainVoyager/E and compared to normative data obtained from healthy volunteers.

Results: Individual anatomico-functional correlations in all MMC patients revealed normal somatotopic organization of M1 for the cortical tongue and finger representations. Foot representations were abnormal with a marked cranio-ventro-lateral shift of 3.1 mm (z-axis), 17.6 mm (y-axis), and 9.2 mm (x-axis) in the right hemisphere and 2.8 mm (z-axis), 11.8 mm (y-axis), and 9.0 mm (x-axis) in the left hemisphere (statistical means). In 50% of the patients unilateral imagined toe movements resulted in bilateral M1 activations.

Conclusions: Patients with congenital paraplegia activate M1 during imagined toe movements. Foot representations are shifted compared normal controls, but the basic principle of somatotopic representations in M1 is preserved. Bilateral M1 activations from unilateral imagined toe movements most likely represent some patients inability to imagine toe movements separately for each side.

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Intraoperative 5-ALA-induced Fluorescence in Meningiomas

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Introduction: Over the past two decades 5-aminolevulinic acid (5-ALA) is increasingly applied for diagnostic and therapeutic purposes in several medical fields. In patients with malignant glioma the use of intraoperative photodynamic diagnosis provided by 5-ALA seems to be associated with a higher degree of extirpation and longer progression-free survival when compared to conventional microsurgery. The application of this technique for resection of meningiomas has been barely explored. Recent reports showed promising findings in 5-ALA-guided resection of meningiomas, especially in cases of occult invasion of the dura and adjacent bone structures. The aim of this study was to evaluate the utility of 5-ALA-induced fluorescence as an intraoperative visual tool in regards to surgical and histological findings.

Methods: A total of 22 consecutive patients undergoing resection of intracranial meningioma from January 2008 – March 2009 were included in this study. After confirmation of normal liver function, 5-ALA was administered orally (20 mg/kg) within 5 hours preoperatively. A total of 10 patients received steroids before surgery. All cases were operated on using standard microsurgical and neuronavigation-guided techniques. Intraoperative 440 nm fluorescence (Pentero), Zeiss, Germany) was applied periodically during and at the end of resection in order to detect tumor infiltration. The fluorescence of the tumor was evaluated intraoperatively by the surgeon and confirmed by subsequent video analysis. Postoperative evaluation consisted in standard histological classification of meningioma (WHO-grading, MIB-1 and mitosis-rate) and postoperative imaging findings.

Results: A total of 21 (95%) patients presented with benign meningioma (WHO I-II) and in 1 (5%) patient anaplastic signs (WHO III) could be confirmed. 5-ALA induced fluorescence was confirmed in a total of 20 (90%) patients and did not correlate with histological findings (n = 19 WHO I-II, n = 1 WHO grade III). 2 (10%) patients showed no 5-ala fluorescence. In 13 (60%) patients a total resection of the tumor was achieved based on the postoperative imaging findings.

Conclusion: 5-ALA-induced fluorescence is a useful and promising visual tool during resection of intracranial meningioma. The novel findings demonstrated in this study in terms of poor correlation with histological findings enhance the usefulness of this intraoperative technique which might be considered as a routine tool to achieve an optimal resection of meningioma.

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5-aminolevulinic acid induced intraoperative fluorescence for resection of a sphenoid-cavernous sinus chordoma by bifrontal transbasal approach

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Introduction: Intraoperative fluorescence guidance with 5-aminolevulinic acid (5-ALA) has been widely used in the glioma resection. However, very few reports are available on the utility of 5-ALA for surgical removal of chordoma. Here we report a case of chordoma that developed in the sphenoid, ethmoid and cavernous sinuses and clivus. The second surgical resection due to progression of the tumor remnants was guided by 5-ALA intraoperative fluorescence and neuronavigation.

Clinical presentation: A 49-year-old woman presented with a right complete ophthalmoplegia, a partial insufficiency of pituitary function (secondary hypothyroidism and hypocortisolism) and a difficulty of the nasal respiration caused by recurrent chordoma. Three years ago she underwent subtotal tumor resection followed by postoperative proton beam therapy. At this time an extended subfrontal transbasal approach with subtotal removal of tumor masses of the orbita, ethmoid and sphenoid sinuses, clivus and nasopharynx was performed. The surgery was guided by intraoperative real-time neuronavigation. Six hours prior to surgery 5-ALA was administered orally. Intraoperatively the tumor masses which were not located in the previous radiation field showed a positive fluorescence under uv-light. The histological evaluation confirmed the diagnosis of dedifferentiated chordoma. Therefore, we could demonstrate that not previously irradiated chordoma cells in this case showed a positive fluorescent reaction induced by 5-ALA.

Conclusion: For the first time in literature 5-ALA induced fluorescence in chordoma was shown in our case. The 5-ALA-fluorescence monitoring and guidance contributed in combination with intraoperative real-time neuronavigation to the detection and removal of chordomas that extends to the sphenoid and cavernous sinus and to the clival region in the posterior fossa prior to radiation.

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Analysis of the impact of fluorescence guided resection of cerebral metastasis

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Objective: Circumferential stripping of cerebral metastasis from the surrounding brain tissue and consecutive radiation therapy is the established therapy procedure. For patients with malignant glioma, tumour fluorescence derived from 5-aminolevulinic acid enables more complete resections of contrast-enhancing tumour, leading to improved progression-free survival. ALA-induced fluorescence has previously been reported for various carcinomas outside the CNS. Objective of the present study was an evaluation of the suitability of 5-ALA-fluorescence guided resection of cerebral metastasis

Methods: 20 patients with single brain metastasis were treated by 5-ALA fluorescent guided resection. Biopsies were taken from the centre and the periphery of the metastasis and for strongly fluorescent adjacent tissue suggesting a tumour rest, biopsies were taken. Fluorescence was determined for each probe as well as from the normal appearing adjacent tissue. Extirpated metastasis and biopsies underwent histopathological analysis of histopathology, morphology and differentiation were analysed morphology, differentiation, and invasiveness and correlated with fluorescence.

Results: Eleven of 21 patients suffered from non-small cell bronchial carcinoma, 2 from rectum-cancer and 1 patient each from oesophagus-, ovarian-, mamma-cancer and malignant melanoma. 4 patients had a relapse after radiotherapy. For patients with the first tumour manifestation, 3 metastasis were sharply delimited from the brain, 13 expanded conically into the brain and 6 had an infiltrative growth pattern. For one patient, the growth pattern could not be determined. All tumours were of low differentiated. 17 metastasis showed 5-ALA-induced fluorescence, whereas 3 metastasis were ALA-negative (melanoma metastasis and two bronchial carcinoma metastasis). For patients with first manifestation of an ALA-positive metastasis a cerebral metastasis sensitivity was 1,0, and the specificity was 0,45. For patients with a previous radiation therapy, sensitivity was much lower (0,55) and all probes without tumour manifestation were ALA-positive. For the normal appearing but strongly fluorescent adjacent tissue, tumour was only present in 75% of all probes.

Conclusion: ALA-fluorescent guided resection may be a tool for patients with the diagnosis of cerebral metastasis. This tool seems not to be suitable for patients with a previous radiation therapy. After macroscopically complete resection, normal appearing but strongly fluorescent tissue showed tumour in 75% for patients with first manifestation of an ALA-positive metastasis. However, additional studies – also with quantification of ALA-fluorescence and a greater collective of patients – are needed for defining a clinical benefit.

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Effects of High Static Magnetic Fields (3T) on Magnetically Adjustable CSF-Shunt Valves: Patient Safety and Imaging Artefacts

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Introduction: Surgical implantation of magnetically adjustable cerebrospinal fluid (CSF) valves is widely accepted as treatment for hydrocephalus, with an increasing number of procedures being performed worldwide. Most of these patients repeatedly undergo follow-up MR imaging. However, exposure to powerful magnetic fields is potentially hazardous and may change valve settings or even cause permanent adjustability failure with the consequence of surgical replacement. Furthermore, the valves may move or heat and cause imaging artifacts precluding diagnostic interpretation. Considering the rapidly increasing number of clinical high-field MR imagers and the lack of data on interference with explanted adjustable CSF-valves resembling *in vivo* conditions, the feasibility was assessed in a phantom study at 3.0 Tesla.

Material and methods: Eleven explanted and one pretested, new, magnetically adjustable Codman-Medos and four explanted Sophy-SU8 valves, all in perfect working order, were randomly selected and exposed to a 3.0-T static magnetic field, including typical entrance and move-out procedures. Standard diagnostic MR-sequences with different SAR were applied.

Results: After 3.0-T exposure, 6 of 16 adjustable valves showed reproducible adjustment failures. There was no relevant MR-imaging-related heating. Magnetic forces were not critical. Diameters of imaging artifacts ranged from 10 mm to 70 mm and were most prominent for T2*-weighted sequences.

Conclusion: Our results strongly suggest that high-field MRI in patients with implanted magnetically adjustable CSF-shunt valves is not safe due to the considerable risk of adjustability failure. Until the results of further investigations in larger series of different explanted adjustable valves are available, hydrocephalic patients should not be exposed to 3.0-T-MRI.

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To acquire MR angiography studies with both high temporal and spatial resolution by combined use of special MR sequences and a blood-pool contrast agent

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Purpose: To acquire MR angiography studies with both high temporal and spatial resolution by combined use of special MR sequences and a blood-pool contrast agent.

Methods and materials: 16 patients (4 AVMs, 10 dural fistulae, one case each of giant aneurysm and cavernous hemangioma) in which neuro-interventional therapeutic procedures were planned were examined by MR angiography in a 3T system (Trio; Siemens Medical Systems). A special sequence (syngo Twist) with a temporal resolution of 0.4 seconds was used for an initial first-pass Gd-enhanced angiography study. The contrast agent used was Vasovist (gadofosveset trisodium; Bayer HealthCare) which is a blood-pool agent that allows for contrast studies up to one hour after injection. An additional 3D MR sequence with high spatial resolution (1 mm) was then performed for detailed study of vascular anatomy.

Results: The Twist sequence with high temporal resolution allowed to identify the nidus and early draining vein in AVMs and fistulae in all cases. The subsequent 3D series with high spatial resolution provided helpful information about vascular anatomy.

Conclusion: First results from this ongoing study show that the combination of MR sequences optimized for temporal and spatial resolution with a blood-pool contrast agent improve detailed study of dynamics and anatomy of vascular cerebral malformations. (Joint research project with Siemens Medical Systems, Erlangen, Germany)

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A new treatment option in traumatic spine surgery of the elderly: percutaneous multilevel dorsal instrumentation (CD Horizon Longitude). First experiences

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Objective: In recent times there has been a remarkable alteration in surgical techniques for spinal instrumentation by developing more and more minimally invasive accesses. For stabilising for instance spine trauma patients the mono- or bisegmental percutaneous instrumentation is already in good clinical practise. Unfortunately in addition to the degree of the underlying disease – tumor, trauma, infection, degenerative – multilevel procedures are necessary. Since September 2008 there is a new system on the german market available which fulfills these demands: CD Horizon Longitude, Medtronic. In a prospective way we evaluated the field of application in elderly patients with osteomyelitis or tumor associated fracture (who had to be operated for quality of life reasons) in a maximal sufficient and minimally the patient stressing way.

Methods: Since September 2008 we operated on (up to now) 6 consecutive patients in a prospective manner who had to undergo a spinal tumor decompression and stabilisation of the spine in a palliative concept. The operation was undertaken in percutaneous multilevel techniques with intraoperative x-ray control in anteroposterior and lateral path of rays. Postoperative the patients were clinically and radiologically (with CT) evaluated.

Results: Blood loss were less than 300 ml in each procedure. OR time is reduced after the initial operation up to 37 %, even so for the learning curve takes its toll. Up to now 50 screws were implanted with minimally access surgery. Postoperative CT control shows no screw displacement. Clinically no neurological alteration.

Conclusion: To insert screws percutaneously in a multilevel procedure is a save and feasible technique using CD Horizon Longitude and advances the surgical options in the afore mentioned tumor patients.

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Correlation of Signal Intensity Ratio on Orbital MRI-TIRM and Clinical Activity Score as a Possible Predictor of Therapy Response in Graves' Orbitopathy – A Pilot Study at 1.5 T

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Purpose: To describe the predictive value of the signal intensity ratio (SIR) in MRI-Turbo Inversion Recovery Magnitude (MRI-TIRM) in patients with Graves' orbitopathy (GO) with regard to predictability of treatment and therapy response.

Methods: 36 consecutive patients with GO and 25 control subjects were included in this prospective pilot study. Patients were clinically assessed according to the EUGOGO recommendations. Active GO was defined by a Clinical Activity Score (CAS) ≥ 3 . A standardized MR-imaging protocol of the orbit was used. On axial T1-w images the amount of exophthalmos, defined as Hertel index, was measured. Muscle inflammation was measured with a ROI (region of interest) set within the brightest extra-ocular muscle both on coronal TIRM and on coronal T1-w sequences. The measured signal-intensity was set in proportion to that of the ipsilateral temporalis muscle, to calculate the SIR. Additionally the cross sectional area of the thickest extraocular muscle was determined, again measured on both coronal TIRM and T1-w sequences.

Results: MRI Hertel readings resulted in a significant difference between patient and control group ($p < 0.0001$). Comparing patients with active and inactive GO, no significant difference in Hertel readings could be detected ($p = 0.18$). SIR in coronal T2-weighted TIRM sequences of 23 randomly assigned individuals in either group ranged from 1.22 to 4.92 (mean 2.04) in patients with GO and from 1.18 to 2.4 (mean 1.63) in controls without GO. The observed differences were significant in coronal T2-weighted TIRM sequences ($p = 0.023$ for the right and 0.022 for the left eye), whereas no significant differences could be detected on fat suppressed Gadolinium enhanced coronal T1-weighted sequences ($p = 0.396$ for the right eye and 0.498 for the left eye). Maximal coronal diameters of extraocular muscles in the horizontal plane ranged from 2.8 to 16.1 mm (mean 10.2 mm; SD ± 2.86 mm), with highly significant ($p < 0.008$) differences between patients and controls.

Conclusion: T2 relaxation time is a reliable tool in detecting active GO. We assume a cut-off value of SIR > 2.5 for a CAS ≥ 4 to discriminate patients with active disease from patients with inactive GO. Furthermore, we found a difference in SIR without gadolinium vs. SIR with gadolinium that might be useful to distinguish inflammatory oedema from intraorbital congestion due to reduced venous outflow.

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Prediction of weaning success by the patients

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Introduction: Weaning from mechanical ventilation represents an important issue in intensive care, since both premature and delayed extubation can adversely impact patient outcome. A spontaneous breathing trial (SBT) is the major diagnostic test to determine if patients can be successfully extubated. Nonetheless, the reintubation rate after a sustained SBT remains about 13%. During the SBT, no active participation of the patient is required. However, the patient's subjective impression of his physiologic responses to the SBT could provide valuable information. We hypothesized that an modified SBT

(standard SBT coupled with the patient's prediction of weaning success) could improve its predictive ability.

Methods: During a 2-year period we prospectively assessed the hypothetical additive value of a patient's weaning self-efficacy (self-inefficacy) to the SBT. Patients considered ready to sustain a SBT were randomly assigned to two groups (intervention vs control). At the end of the SBT subjects from the intervention group were interviewed about their weaning efficacy: those giving a clearly affirmative answer formed the PEE (Post-extubation self-efficacy) while those with a negative (or ambiguous) answer constituted the PEI (Post-extubation self-inefficacy). All patients successfully completing the SBT were immediately extubated (without considering their prediction). The follow-up examined weaning failure (death or need of ventilatory support within 48 hrs after extubation) and its causes, mortality and ICU-LOS.

Results: Out of 211 patients, 115 formed the PEE (38 PEI and 58 control). Weaning success was higher in PEE than in PEI (90% vs 45%; $p < 0.001$) or in the control (78%; comparable to literature data). Reintubation rate was 3% (16% and 3%) in PEE (PEI and control) and rescue therapy with NIV was 8% (39%; $p < 0.01$ and 19%). ICU-LOS

was lower in PEE than in PEI (8 ± 7 vs 12 ± 11 days; $p = 0.047$) as well as mortality (3% vs 11%). Main reasons for reintubation and rescue therapy with NIV were similar between groups. A multivariate analysis revealed age as the only variable associated to weaning success (fig. 1).

Conclusion: Our study suggests that including the patients' prediction of weaning success might highly improve the accuracy of a SBT. Further studies regarding the enlarged SBT are warranted to confirm these preliminary data.

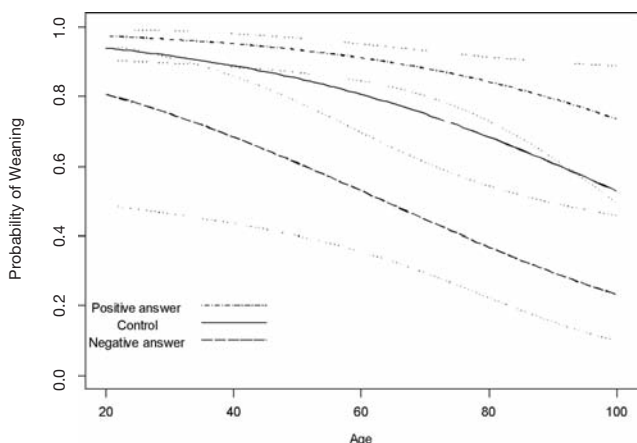


Figure 1
Weaning success according to the patients' prediction and age. The 95% confidence interval dotted lines are displayed for the positive answer and negative answer groups.

Nurse registered cumulative fluid-balances in critically ill patients – are they sufficiently accurate and consistent?

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Introduction: Documenting the qualitative and quantitative properties of administered and lost fluids is a common critical care monitoring practice. These nurse-registered fluid balances (FB) are used to optimize patient care and in clinical decision-making; recent studies reporting superior outcomes expressly refer to (negative) FB.

Methods: We prospectively assessed the accuracy (review of all fluid balance charts and correction of arithmetic errors) and consistency (gold standard: body weight changes [BWC] registered with standardized measurements of body weight) of nurse-registered cumulative FB. Total (TFB) and daily FB (DFB = total FB/LOS) were calculated. We analysed the unadjusted cumulative FB (UnaFB: without considering additional losses, i.e. perspiration/fever/liquid faeces) and the adjusted cumulative FB (AdjFB: considering the above as proposed in the literature) in all patients (ALL) and in 3 subgroups (cardiac-cerebral: CARD; septic: SEPTIC; OTHERS). We calculated 1 L = 1 kg.

Results: FB were inaccurate in 49 of 147 cases (33%) (error range: -3.61 to +2.02 L, mean arithmetic error \pm SD: $+0.03 \pm 0.81$ L, mean absolute error: 0.45 ± 0.6 L). The body weights at admission and discharge were 78.58 ± 18.92 kg and 79.29 ± 18.77 kg, with a BWC of 0.75 ± 3.25 kg (0.30 ± 1.27 kg per day). UnaTFB were 2.01 ± 4.02 L, UnaDFB 0.66 ± 1.25 L. AdjTFB was 0.57 ± 3.45 L, AdjDFB 0.20 ± 1.23 L. Correlation (R^2) and Bland & Altman was poor between BWC and UnaTFB (0.552 and -1.26 ± 5.41 kg) and slightly better between BWC and AdjTFB (0.714 and $+0.18 \pm 3.68$ Kg). The SD of the difference between BWC and FB per day of the ICU stay was always >1 kg. A multiple regression model including UnaTFB, duration of intubation, maximum temperature, estimation of liquid faeces, age and the calculated caloric deficit during the ICU stay, only modestly improved correlation (R^2 0.773). In the detail analysis, consistency was scarce for all subgroups.

Conclusion: FB are often inaccurate and they are not consistent with the gold standard of BWC (standardized body weight measurements). The correlation and the agreement with BWC of both AdjTFB and UnaTFB are poor, with SD per ICU day-stay >1 kg or L. Multiple

regression models including several variables slightly improve correlation, yet remaining disappointing. Consequently, clinical decisions should rather be based on other methods than FB.

Safety of recombinant factor VIIa in patients with circulatory assist devices

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Introduction: Recombinant activated factor VII (rFVIIa, Novoseven) is indicated for treatment of bleeding in hemophilic patients with antibodies against factor VIII or IX. Although not licensed or agreed for other use, it is increasingly reported for refractory hemorrhage. Implantation of circulatory assist device requires tight anticoagulation therapy and may be complicated by massive bleeding. We report our experience with off-label use of rFVIIa in 9 patients with circulatory assistance.

Methods: We retrospectively reviewed all patients treated with rFVIIa for massive bleeding secondary to anticoagulation during circulatory assistance between March 2004 and November 2008. rFVIIa use and dosage was decided according to local guidelines when available (released in May 2006). According to these guidelines, systematic crosscheck for active correction of hypothermia, acidosis, and coagulation factors with parallel consideration for any feasible interventional embolisation or haemostatic surgery are required for authorization of rFVIIa use.

Results: 9 patients with circulatory assistance received rFVIIa. Median patient age was 43 years (<1 to 55). 8 underwent cardiac surgery (including 2 heart transplants). One had bi-pulmonary transplant. The device was extra-corporeal-membrane-oxygenator (ECMO) in 7 and Ventricular Assist Device (VAD) in 2 patients. Median rFVIIa dose was 100 mcg/kg (45 to 180), split in 2 or 3 injections in 6 cases. Bleeding control was obtained in 5 patients (60%). Mortality rate at 30 days was 40%, including 2 within 48 hours from failure to control hemorrhage. We observed one thrombo-embolic complication (stroke) which may potentially be related to rFVIIa administration.

Conclusion: Our series suggests that the cautious use of rFVIIa may be an option in patients with circulatory assist device suffering from massive hemorrhage refractory to conventional treatment.

Guidelines associated decrease in mortality with rFVIIa for refractory hemorrhage

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Introduction: Recombinant activated factor VII (rFVIIa, Novoseven) is indicated for treatment of bleeding in hemophilic patients with antibodies against factor VIII or IX. Although not licensed or agreed for other indications, its use for refractory hemorrhage is increasingly reported. We reviewed our experience with off-label use of rFVIIa in this indication.

Methods: We retrospectively reviewed all patients treated with rFVIIa from March 2004 to November 2008 in our hospital. Those included in a multicentric study ($n = 10$), or treated within approved ($n = 3$) or non hemorrhage ($n = 4$) indications were excluded. Initial use imposed constringent guidelines implementation and use of rFVIIa requires

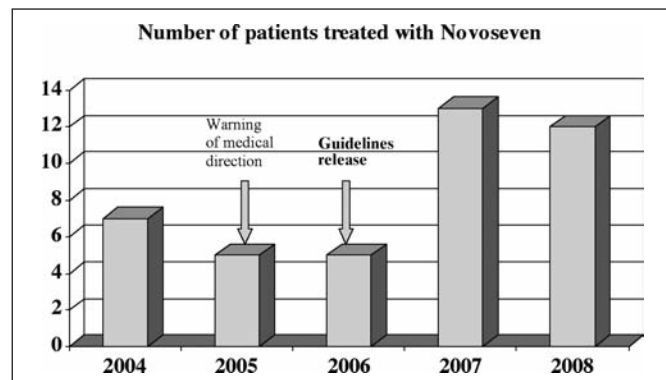


Figure 1

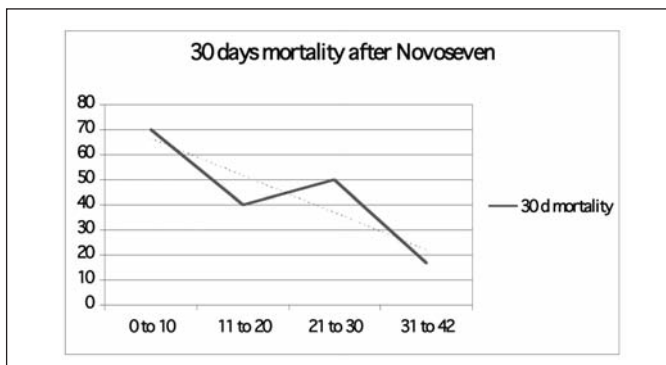


Figure 2

crosscheck for active correction of hypothermia, acidosis, and coagulation factors and consideration for any feasible haemostatic surgery or embolisation.

Results: 42 patients were included. Median age was 39 years and 60% were males. Underlying condition was trauma in 14% of cases and surgery-associated hemorrhage in 76%. Bleeding stopped in 79% of cases. Potentially associated thrombo-embolic complications were observed in 5 (11.9%) cases, only one being very likely linked to rFVIIa. Overall 30 days mortality was 40.5%. The initial experience was followed by a decline in the use of rFVIIa and the release of guidelines by a continuous increase (fig. 1). We observed a progressive decline in the 30-days mortality rate, from 70% in the first ten patients to 17% in the last 10 (fig. 2). The average number of blood transfusion before rFVIIa remained stable but the median rFVIIa doses decreased from 206 mcg/kg in the first ten patients to 80 mcg/kg in the last ten.

Conclusion: Local guidelines release did not decrease the number of cases but seems to impact on when and to whom rFVIIa is administered. Their release, associated with increasing experience, was associated with a striking lowering of mortality rate.

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Estimated prevalence, diagnosis and management of pulmonary hypertension in Swiss ICUs: results from the PHICUSS1 study

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Objectives: The aim of the PICUSS (Pulmonary hypertension in the ICU – Swiss survey 1) study is to investigate the prevalence of PH of any cause in ICUs of primary, secondary and tertiary Swiss hospitals; the most frequent causes of PH, and its diagnostic and therapeutic approach. Herewith, we present preliminary results, while the study is still ongoing.

Methods: The present data were collected via a questionnaire addressed to the heads of the ICUs asking for a personal estimation of the prevalence of PH of any cause in their ICU, the diagnostic and current treatment approach. The questionnaire was addressed to the heads of 61 ICUs in March 2009. Answers could be provided electronically via web or on a paper sheet.

Results: Till today of the 61 ICUs, 11 answered to the questionnaire (18%). From these 5 are located in primary, 4 in secondary, and 2 in tertiary hospitals. The estimated prevalence of PH was 8.8%. The most common causes of PH were severe COPD (30%), ARDS (21%), left heart failure (18%), pulmonary embolism (12%), alveolar hypoventilation (9%), and finally with each 1% sleep disorders and idiopathic. Echocardiography is the primary diagnostic tool for all participants. For confirmation of suspected PH, a pulmonary artery catheter (PAC) is used in 45% of the ICUs. For the management of patients with PH 36% are using echocardiography only and 64% a PAC. Two regional hospitals will transfer their patients with PH to a tertiary hospital ICU. The drug of first choice for PH treatment is inhaled ilomedin in 44% of the ICUs, followed by iv-nitrates in 33% and inhaled NO or epoprostenol in 11%, respectively. To support the right ventricular function 63% will use as a first choice dobutamine, 27% noradrenaline and 9% milrinone.

Conclusion: The results of the present survey suggest that approximately 1 of 10 patients admitted to ICUs has PH (mean pulmonary artery pressure ≥ 25 mm Hg or systolic pulmonary artery pressure ≥ 30 mm Hg). Echocardiography is the preferred diagnostic tool, whereas for PH management roughly three quarter use a PACs. Inhaled iloprost and dobutamine are the preferred drugs for PH treatment in the ICU. The currently low number of participating ICUs limits the present conclusion, number, which we like to increase considerably by September 2009.

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The morbidity and mortality of critically ill patients undergoing continuous veno-venous haemodiafiltration

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Objectives: The aims of the study were 1) to describe the population characteristics of ICU patients undergoing continuous veno-venous haemodiafiltration (CVVHDF); 2) to review our anticoagulation practice; 3) to investigate whether the type of haemofilter influences clinical or laboratory parameters, particularly platelets and red blood cell counts.

Methods: The observational study was performed in a 12-bed medical ICU. Patients with coagulation abnormalities or need for systemic anticoagulation were not included in the study. Routine clinical and laboratory parameters were collected from consecutive patients requiring CVVHDF, which was performed with a multifiltrate machine (Fresenius, Homburg, D) using the capillary haemofilter AV 1000s (n = 17) or AV 600s (n = 14) at a rate of 35 ml/kg/h. Anticoagulation was performed with heparin aiming at aPTT values of 40–50s post-filter and <45s systemically. CVVHDF observation was stopped when the standard anticoagulation procedure was abandoned, e.g. change to pre-dilution technique. Results are given as median (range) or percentages.

Results: The 31 included patients were 69 (35–87) years old, and 65% were male. SAPS II and SOFA scores were 63 (30–98) and 12 (8–15), respectively. 82% of the patients suffered from acute renal failure, 53% had sepsis, and 53% required noradrenaline. 6h after the start of CVVHDF, patients received 450 (0–900) U/h heparin. Post-filter aPTT was on target, too low or too high in 18%, 33% and 50% of the patients, respectively. Systemic aPTT was too high in 41%. CVVHDF duration was 35 (7–128) hours, and 2 (1–4) filters were used during this study period. Creatinine at baseline was 299 (26–909) $\mu\text{mol/l}$, and it declined by 44 (0–74) % after 1 day of CVVHDF. Platelets dropped by 57'000 (0–258'000) /ul during CVVHDF, while hemoglobin decreased by 1.4 (0–3.9) g/dl, leading to the transfusion of 1 (0–4) bags of red blood cells. Filter observation stopped due to death of the patient (13%), need for systemic anticoagulation (13%), repeated clotting (35%) and recovery of renal function (39%). ICU length of stay was 7 (1–167) days, and ICU mortality reached 32%. No significant differences were found, when the two haemofilters were compared.

Discussion: Patients requiring CVVHDF suffer from a high morbidity and mortality. CVVHDF is very effective, but complicated by repeated clotting and relevant drops in platelet and red blood cell counts. The type of haemofilter does not make any significant difference.

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Impact of Neurally Adjusted Ventilatory Assist on respiratory parameter variability in patients with acute respiratory failure

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Introduction: Neurally Adjusted Ventilatory Assist (NAVA) uses the diaphragmatic electrical activity (Eadi) to deliver inspiratory pressure in proportion to the patient's inspiratory effort, and to both initiate and terminate pressurization. Compared to pressure support (PS), NAVA increases the variability of the ventilatory pattern, which could have favorable consequences given the data suggesting that loss of variability adversely affects outcome.

Objectives: To compare the effects of NAVA vs. PS on tidal volume (VT), respiratory rate (RR) and VT variability and to explore the influence of various NAVA gain and PS levels on VT variability in intubated patients.

Methods: Comparative physiologic study. We recorded airway pressure (Paw), flow (F), respiratory rate (RR) and tidal volume (VT) during 20 min. in PS (set by the clinician) and in NAVA with gain set to obtain the same peak airway pressure as the total pressure obtained in PS. We then progressively increased PS level and NAVA by progressive

increasing of NAVA gain. We compared VT, RR, minute volume (MV) and VT variability (= coefficient of variation, CV) between both 20 min. periods as well as the influence of increasing NAVA gain and PS level on VT variability.

Results: Preliminary results (mean ± SD): 5 patients (age 75 ± 12 yr, 1 M/4F, BMI 25.7 ± 4.1), 2 pts with COPD, 1 with restrictive disease.

	VT/kg IBW	RR.	MV	CV VT
PS	9.01±1.23	16.25±2.28	8.47±2.33	12.72±4.96
NAVA	8.14±2.0	21.38±7.06	9.80±3.64	36.06±16.63
p	0.28	0.09	0.15	0.02

IBW: ideal body weight

Increasing PS level was not correlated with a predictable effect on VT variability. Increasing NAVA gain however, was associated with an increase in VT variability:

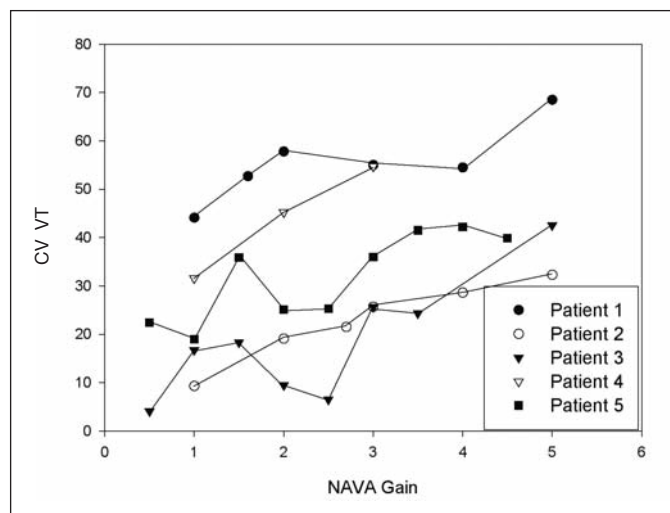


Figure 1
Titration of NAVA gain: effect on VT variability

Conclusion: Compared to PS at comparative levels of ventilatory support, NAVA increases VT variability, tends to decrease VT and increases RR. Moreover, increasing NAVA gain increases VT variability. The clinical impact of these changes warrants further investigation.

Nutrition of non-invasive ventilated intensive care patients: preliminary descriptive data

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Introduction: The use of non-invasive ventilation (NIV) varies much across ICU's but has become very frequent. In the CHUV's ICU, 14% of the patients benefits of NIV in 2007. These patients are suspected to be at risk of undernutrition for several reasons: pre-existent chronic pathology (COPD), increased energy requirement, difficulties to eat (breathlessness, mask for several hours), if fed enterally: apprehension of broncho-aspiration by staff and, if fed per os: unconsciousness of insufficient energy intake by staff. This pilot observational study aimed at characterizing nutrition pattern of these patients and exploring influence's factors on their energy balance.

Methods: On a 7 weeks period, each patient requiring more than 4 hours of NIV/day, admitted in the ICU was included the day after beginning NIV and followed up until transfer. Exclusion criteria were post-extubation weaning, NIV for less than 1 day, tracheotomy and

end of life. Data were retrieved prospectively from the computerized patient file. Variables: demographic data, BMI, SAPSII, daily energy delivery and energy target, daily type of nutrition (oral nutrition (PO), enteral with or without per os (EN), mixed: enteral + parenteral (MIX) or parenteral only (PN)), daily length of NIV and number of sessions per day, report of broncho-aspiration in the nurses and medical report and ICU outcome.

Results: 49 patients included, 2 died in the ICU. Critically ill patients: SAPSII: 42.2 ± 9.8, age 63.5 ± 14.5 years, BMI relatively high: 27.1 ± 8.1. 237 days analyzed. In half of these, nutrition was EN (114 days) and in a quarter PO (65 days). PN (25 days) and MIX (14 days) were less frequent, no nutrition at all represents only 19 days. Mean daily energy balance was highly negative: - 530 kcal/day. In nurse reports, broncho-aspiration appeared only twice and once in medical report, which is relatively poor in regard of the concern of the staff (no systematic assessment was done in this observational study). Prokinetics were given in 17% of the days. After inclusion, NIV represents 165 days and a median of 3 sessions of 66 minutes per day. Duration per day varied a lot: mean of 300 " 335 minutes (median 192 minutes).

Conclusion: Our preliminary data show that patients with NIV in our university ICU are critically ill and at risk of a highly negative energy balance. Additional analyzes are still ongoing to correlate different factors with the energy balance and further study is needed to show causality.

ARDS without evident predisposing factors: a case series with histological diagnoses

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Background: Studies evaluating epidemiology of or novel interventions in ALI/ARDS-patients (pts), often include a significant percentage of conditions ascribed as direct or pulmonary injuries, classified as cases of "unrecognized etiology". In this group of pts with unknown risk factors, there are a subgroup of acute, diffuse, noninfectious lung injuries fulfilling the clinical, physiological and radiological criteria for ALI/ARDS.

[Schwarz M et al. Chest. 2004;125: 1530-5] It is important to differentiate these cases from the classical ALI/ARDS types, because most of them may dramatically respond to systemic corticosteroids.

Methods: we conducted a 3-year review of all ARDS-pts (AE Consensus Conference), and we isolated the cases who had lung open or closed biopsies because of a lack of improvement in patients with potential indications for CST treatment and with negative microbiological sample cultures.

Patients and results: This series include 5 of 33 ARDS-pts (15%). The following table summarizes diagnoses and pts-characteristics:

Pt	Diagnosis	Age/Gender	PaO ₂ /FiO ₂	HISTOLOGY	BAL	TREATMENT	ICU OUTCOME
1	AIP	73 / M	89 mm Hg	TBB / PM	PMN/FM	AB/CST	D
2	UIP	70 / M	67 mm Hg	SURGICAL	np	AB/CST	A
3	COP	39 / M	112 mm Hg	SURGICAL	np	AB/CST/AZ	A
4	AHP	65 / M	76 mm Hg	SURGICAL	PMN/LY	AB/CST	A
5	MILIARIS	85 / M	186 mm Hg	SURGICAL	PMN/LY	AB/CST	A

AIP = Acute Interstitial Pneumonitis; UIP = Usual interstitial pneumonia; COP = Cryptogenic Organizing pneumonia; AHP = Acute hypersensitivity pneumonitis; TBB = Transbronchial Biopsy; PM = Post-mortem exam; np = Not performed; PMN = polymorphonuclear cells; LY = Lymphocytes; AB = Antibiotics; CST = Corticosteroids; AZ = Azathioprine; D = Dead; A = Alive; PaO₂/FiO₂ = PaO₂-FiO₂ ratio at admission; FM = Foamy macrophages.

Conclusions: In these selected "ARDS"-cases with negative bacteriological results and lack of improvement after few days, lung biopsies provided a strong treatment contribution after CST were added to a «blind» large spectrum antibiotic treatment.

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Valproic acid intoxication imitating brain death (case report)K. Auinger¹, V. Mueller¹, A. Rudiger¹, M. Maggiorini¹¹ Medical ICU, University Hospital, Zurich, Switzerland

Introduction: The declaration of brain death requires a standardized clinical neurological examination and, importantly, the resolution of the underlying cause. Because sedative and anesthetic agents can closely mimic brain death, intoxications must be ruled out. Aspects of brain stem function, particularly the pupillary responses to light remain intact in most cases of poisonings. Intoxications that cause a condition that fully mimics brain death have only been described in cases of intoxications with tricyclic antidepressants and barbiturates so far.

Case report: We report on a 19-year old man who presented with severe confusion and developed a deep coma over the next hours. Clinical examination revealed absence of all brain stem reflexes including missing pupillary responses to light. Blood analysis revealed a valproic acid intoxication with levels of 12340 µmol/l (norm 350–700 µmol/l) with concomitant severe hyperammonemia of 500 µmol/l (norm <30 µmol/l) and treatment was initiated including the administration of L-carnitine and a continuous veno-venous hemodiafiltration. Brain edema as the cause of absent brain stem reflexes was ruled out twice by computed tomography. After normalization of the serum levels, the patient had a full clinical recovery.

Discussion: Coma due to valproic acid overdose is mostly attributed to the development of severe hyperammonemia and consecutive brain edema. Interestingly, there was no radiological evidence for cerebral edema in our patient. We hypothesize that the imitation of brain death must have been due to a direct toxic effect of valproic acid. Valproic acid increases regional neuronal concentration of gamma amino butyric acid (GABA) by inhibiting its metabolism and increasing its synthesis. After activation, the GABA receptor causes influx of chloride ions, which hyperpolarizes the cell and renders it resistant to further depolarization. Increases in GABAergic activity produce a generalized depression of the central nervous system. There is a range of sedative and anesthetic agents that can mimic brain death. Nevertheless pupillary responses to light usually remain intact. Pharmacologic conditions that completely abolish all brain stem functions are rare and include tricyclic antidepressants and barbiturates poisoning. However, no association with valproic acid overdose has been described so far, which makes this case exceptional.

Spontaneous intracranial hypotension – an interdisciplinary challengeC.F. Fung¹, L.A. Andereggen¹, M.R. Reinert¹, J.B. Beck¹, A.R. Raabe¹¹ Inselspital, Bern, Switzerland

We report about a severe, life-threatening case of spontaneous intracranial hypotension (SIH). Establishing the diagnosis and management including long term intensive care turned out to be an interdisciplinary challenge. A 42 y/o patient presented to the emergency room complaining about headache for one week. Initial exam revealed slight nuchal rigidity, gait unsteadiness with a GCS of 15. MRI showed chronic subdural hematoma (cSDH) and gross dural enhancement. An LP revealed xanthochromic cerebrospinal fluid (CSF) with slight elevation of protein. The headache resolved with conservative treatment, however, ataxia increased and another CT showed progression of SDH. Evaluation by radioisotope cisternography showed no CSF leakage and the cSDH was evacuated. Patient recovery was slow and with a high suspicion for SIH we performed spinal MRI with intrathecal gadolinium application revealing extradural contrast enhancement at T7-T11, as a sign for CSF leakage. Because of deterioration into coma we performed an epidural blood patch (EBP) on day 17 ranging from L1 up to the lower thoracic spine. Despite EBP the patient deteriorated (decorticate posturing, mydriasis) and a recurrence of the cSDH was evacuated. Serial CT/MRI showed sagging of the brain, a pontine lesion and, again, growth of the SDH. After repeat trepanations (day 19 and 24) and a EBP (day 25) we were still convinced that spinal CSF loss was the causal problem and performed dynamic myelo-CT scans showing a leakage at T10/11. Meanwhile patient needed a craniotomy and hematoma evacuation (day 29) and a third EBP (day 43) at T 10/11. Despite targeted EBP, the dynamic myelo-CT scan showed a persisting leakage so we decided to explore the leak microsurgically. We found a thin, leaky dural pouch and could seal it with an autologous fat patch. The repeat dynamic Myelography did not show a remaining leakage. After microsurgical repair the patient recovered quickly. In total the patient was hospitalized for 66 days, had 5 operations, 3 EBPs, 12 cCT scans, 2 cMRI, 5 spinal MRI and 3 myelographs. On

day 66 the patient walked out of the hospital with a mild dysarthry in good clinical condition.

In conclusion the sustained suspicion for SIH with a CSF leak as the pathophysiological cause and sophisticated neuroradiological diagnosis (MR with i.th. contrast and dynamic myelography) and microneurosurgical repair lead eventually to a good outcome after long intensive care treatment.

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Meningitis during treatment of prolactinoma with dopamine agonist, a case report and review of the literatureS. Berkmann¹, H. Landolt¹¹ Neurochirurgische Klinik, Kantonsspital Aarau, Aarau, Switzerland

Introduction: Treatment of prolactinoma by chemotherapy reduces the tumour size in short time. Transcranial CSF permeability has been described as complication in patients undergoing chemotherapy for the treatment of prolactinoma. While CSF leakage during medical therapy is rare, a case of meningitis in absence of clinical signs of rhinoliquorrhea has not been reported. We describe a patient with an invasive macroprolactinoma developing meningitis from acute rhinosinusitis during dopamine agonist treatment.

Methods: A 62-year-old man presented with a history of headaches and acute IVth nerve palsy. The pituitary hormone profile showed high levels of prolactine (>750 µg/l). On MRI and CT scan a large sellar mass (3.5x3.2x3.1 cm) with signs of bone erosion was detected. In addition, signs of pansinusitis could be demonstrated. After two days of dopamine agonist therapy the patient developed bacterial meningitis.

Results: The patient successfully underwent antibiotic therapy and emergency infundibulotomy and sphenotomy. The dopamine agonist therapy was discontinued for two days until response to antibiotics was seen. After antibiotic therapy, the tumor was partially resected and the sella was closure by trans-sphenoidal approach. On discharge, normal prolactine levels, complete recovery of the IVth nerve palsy, and no CSF fistula could be demonstrated.

Conclusion: Meningitis has to be considered as a severe complication in patients presenting with invasive macroprolactinomas with suprasellar extension and erosion of the sellar floor. Patients presenting with such tumours may profit from exclusion of an acute rhinosinusitis before receiving therapy with dopamine agonists. In case of clinical symptoms or radiological signs of acute rhinosinusitis, these patients may have antibiotic therapy and transnasal repair of the eroded sella before dopamine agonist therapy is installed. Discontinuing dopamine agonist therapy as an intermittent measure in the case of rhinoliquorrhea or meningitis may prevent further unplugging of the sella. Subsequent transsphenoidal surgery for tumour resection and reconstruction of an impermeable barrier is mandatory.

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Primitive neuroectodermal tumors (PNET) deriving from the skull: case report

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Object: Primitive neuroectodermal tumors (PNET) have been defined as a heterogeneous group of malignant, neuroepithelial, cerebral neoplasms found primarily in children. Rarely do these tumors occur in adults, few have been reported.

Case report: We present a 42-year-old man, coincidentally diagnosed with a supratentorial PNET, deriving from the left frontal skull with meningeal assets. The preoperative radiological findings showed signs compatible with the diagnosis of meningioma. 10 years prior to diagnosis the patient underwent surgical resection and adjuvant radiotherapy (54 Gy) of an endocrine inactive pituitary macroadenoma. No relevant clinical symptoms were present at admission. Radical extirpation of the frontal tumor was chosen to be the primary treatment. Tumor infiltration of the skull was evident during surgery. The intraoperative 5-ALA fluorescence was negative. The bone flap was replaced with polymethylmetacrylate cement. The histological examination of the intracranial tissue and bone demonstrated a PNET (WHO IV). The postoperative staging (MRI of the spine, whole-body PET, esophago-gastro-duodenoscopy, and CSF analysis) showed no signs of further tumor manifestation. Due to histological signs of tumor remnant in the skull, an enlargement of the craniotomy was indicated and uneventfully performed. The histological evaluation after the second procedure demonstrated tumor-free edges in the skull. EWS/FLI1 fusion transcripts were not detected. The patient was discharged with no neurological deficits. A local postoperative radiotherapy (60 Gy) was performed and the patient could resume his previous job. Periodically radiological follow-up (MRI and CT) is planned.

Conclusion: To our knowledge, we describe the first case presenting with an isolated PNET of an adult deriving from the skull bone with no peripheral manifestation. In this patient we could not demonstrate molecular genetic features previously known to be strongly associated with the Ewing family of tumors.

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Severe necrotising community acquired pneumonia related to penicillin-susceptible staphylococcus aureus secreting Panton-Valentine leucocidine (PVL) toxin: need for early aggressive treatment without betalactams

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Case report: A 32 year old previously healthy male patient presented with rapidly progressive community acquired pneumonia, preceded by influenza-like symptoms. Initial presentation was characterized by marked leucopenia, multilobar lung infiltrates, acute respiratory failure, acute renal failure and severe cardiac dysfunction. Gram staining of the sputum revealed sheets of Staphylococci. Because of penicillin allergy history empirical treatment including levofloxacin (750 mg/day) and vancomycin (2 g/day) was initiated. Methicillin sensitive Staphylococcus aureus (MSSA) grew on sputum cultures, blood culture remained sterile. Evolution over the next days was characterized by persistence of high fever and the development of bilateral lung abscesses. Based on clinical suspicion of MSSA producing the Pantone-Valentine leucocidine (PVL), antibiotics were changed to clindamycin (600 mg qid) and linezolid (600 mg bid) as these agents have been demonstrated to decrease the production of the toxin. High dose immunoglobulins (2 g/kg) were added in order to neutralize the toxin according to recent literature. Chills and extension of lung abscesses stopped within 2 days. The patient required prolonged mechanical ventilation, paracentesis for pleural effusion and iterative bronchoscopy for exudative pneumonia. A tracheostomy was performed on day 18 and closed after complete weaning on day 31. The patient recovered fully, with complete resolution of the lung abscesses and was discharged home on day 50. Members of his family were prophylactically decolonized. The leucocidin of Pantone Valentine was identified by polymerase chain reaction (PCR) on the strain isolated from the sputum. In addition Influenza B DNA was detected in naso pharyngeal secretion.

Discussion: We report a rare case of severe community-acquired penicillin-susceptible *S. aureus* PVL toxin secreting necrotizing pneumonia, following influenza illness. This particular staphylococcus strain was described to be responsible for small outbreaks of severe necrotizing pneumonias in the 50's but has been reported only rarely over the last decades. Increasingly, cases have been reported almost exclusively in the US in association with community-acquired methicillin-resistance. In contrast, only a few isolated cases have been reported in France and in northern Italy. In recent series, a fatal outcome of 80% has been reported in patients on monotherapy with betalactam agents. Betalactam antibiotics seems to increase by several mechanisms the secretion of PVL toxin. Early clinical suspicion is crucial for the rapid initiation of agents susceptible to decrease PVL toxin production (clindamycin, linezolid). The use of high dose immunoglobulins is susceptible to neutralize the toxin but should probably be restricted to microbiologically proven cases.

Conclusion: This case report illustrates the need for clinicians to remain suspicious of unusual clinical presentations and evolutions and stresses the importance of a systematic multidisciplinary approach.

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Laparoscopic epilepsy surgery (case report)

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Case report: We report on a 37-year-old woman who suddenly became disoriented, hallucinating and agitated. Two weeks earlier she was complaining of headache lasting for several days. On admission, she presented with low-grade fever, gait disturbances and behavioural changes. Blood cell counts and routine biochemical analyses showed no abnormalities. Brain imaging was normal, and lumbar puncture revealed mononuclear pleocytosis. Microscopic analysis of cerebrospinal fluid revealed no microorganisms or malig-

nant cells, cultures yielded no bacterial growth, and PCR testing for viruses was negative. ANA, ANCA and anti-DNA titres were normal, and autoantibodies against the conventional CNS antigens were undetectable. 10 days after admission, the patient developed generalized seizures. For a total of 73 days, the patient remained in a mostly non-convulsive status epilepticus refractory to treatment. When the patient developed swelling of her right leg, duplex sonography confirmed a deep vein thrombosis and incidentally revealed a suspicious finding in the pelvis. Abdominal CT showed a cystic mass in the left ovary consistent with a mature ovarian teratoma. Treatment with high dose prednisolone and intravenous immunoglobulins was started and the patient underwent laparoscopic teratoma removal. Histologic examination revealed the presence of neuronal tissue within the teratoma, and high titres of antibodies against NMDA-receptors were detected in the patient's liquor. Three days after surgery, the seizures stopped. After a rehabilitation period of 4 months, the patient fully recovered.

Discussion: Limbic encephalitis associated with ovarian teratoma predominantly affects young women and is characterized by prominent psychiatric symptoms, seizures and autonomic abnormalities. Symptoms are in general reversible upon tumour removal. Recently, autoantibodies to NMDA-receptors have been detected in these patients, which probably arise by autoimmunisation due to the expression of NMDA receptors in neuronal tissue within the teratoma. It is assumed that these autoantibodies can cross the blood-brain barrier only after its disruption by a precedent hit such as a viral illness. The antibodies lead to reversible downregulation of hippocampal NMDA receptors through a non-cytotoxic mechanism.

Conclusion: Teratoma-associated encephalitis should be considered in any case of unexplained non-viral encephalitis, especially in young women.

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Encephalopathy and cardiac arrest as the first manifestation of medium-chain acyl-CoA dehydrogenase deficiency in an adult: an entity to introduce in the intensivist field

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Introduction: Medium-chain acyl-CoA dehydrogenase deficiency (MCADD) is the most frequent in-born error of fatty acid oxidation metabolism (incidence 1:10.000 live births). MCADD is usually symptomatic in early life with hypoketotic hypoglycemia, lethargy, coma, seizures and death, following prolonged fasting and febrile infections. However, this disease may be silent during childhood and may manifest as a catastrophic event in adult life, as reported here.

Case report: A 24 year-old man was admitted with the suspicion of acute encephalitis, after one day of headache, vomiting and progressive confusion. He presented suddenly a pulseless electrical activity, with wide QRS at EKG, suggestive of intoxication. He had a metabolic acidosis (pH 7.28, bicarbonates 19.5 mmol/L, lactate 5.7 mmol/L, anion gap 22.5 mmol/L), hyperkalemia at 7.3 mmol/L, hypoglycemia at 2.9 mmol/L, blood ammonium level at 284 mmol/L. Urine ketone bodies were not increased. Prolonged cardiopulmonary resuscitation and repeated glucose administration were followed by return to sinus tachycardia. The patient developed rhabdomyolysis (CK 161.000 UI/L) and elevated liver enzymes. A liver CT scan was compatible with steatosis. An acute anuric renal failure required renal replacement therapy for 19 days. He was on mechanical ventilation for 6 days until encephalopathy improvement. He returned home 30 days later with an almost full recovery. The urine collected in the acute phase showed elevated suberylglycine, hexanoylglycine, phenylpropionylglycine and octenedionate together with significant dicarboxylic aciduria; acylcarnitine profile in plasma showed markedly increased C6-C8-C10:1 acylcarnitine, thus confirming the suspicion of MCADD. Molecular analysis revealed homozygosity for the classical MCAD mutation, which is present in 80% of symptomatic MCADD patients. Two days after treatment, blood acylcarnitine profile was normalized, underlying thereby the importance to collect samples for analysis during acute presentation.

Conclusion: Although MCADD symptoms are expected in early childhood, patients with this in-born error of metabolism may present anytime in emergency department or ICU, with potentially lethal conditions. Symptoms of this disorder should be known by intensivists in order to react promptly, as soon as the first signs of encephalopathy appear. Glucose administration reverse the symptoms and may prevent cardiac toxicity and cardiac arrest.

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Life-threatening laryngeal edema and hyponatremia during hysteroscopy (case report)B. Wegmueller¹, K. Hug², C. Meier Buenzli³, M. Maggiorini¹, A. Rudiger¹*1 Medical Intensive Care Unit, University Hospital Zurich, Zurich, Switzerland; 2 Gynecology and Obstetrics, Canton Hospital Nidwalden, Stans, Switzerland; 3 Anesthesiology and Intensive Care, Canton Hospital Nidwalden, Stans, Switzerland*

Case report: A 43-year-old woman underwent an elective hysteroscopy due to excessive bleeding from uterine myomas. After spinal anesthesia, the patient was placed in lithotomy position. The dilatation medium included 2.7% sorbitol and 0.54% mannitol (osmolality 178 mosmol/l). After 80 minutes the patient developed acute pulmonary edema and swelling of the neck. Oral intubation failed, but the placement of a laryngeal mask was successful and an emergency tracheostomy was performed. By that time, 76 liters of irrigant fluid were used and no exact fluid balance was available. The patient became hypotensive and required noradrenaline. Arterial blood gas analysis revealed hyponatremia of 78 mmol/l. Treatment with iv furosemide, hypertonic NaCl and bicarbonate 8.4% was initiated. After transfer to a tertiary medical center the arterial blood gas analysis revealed the following values: pH 6.90, pCO₂ 7.6 kPa, pO₂ 7.8 kPa (with FiO₂ of 1.0), bicarbonate 14.2 mmol/l, base excess -17 mmol/l, sodium 98 mmol/l, and lactate 5.3 mmol/l. In order to correct the acidosis and to remove the absorbed irrigation fluid, a continuous veno-venous hemodiafiltration was started (dose 40 ml/kg body-weight). In due course, haemodynamics and lactate normalised. Weaning from the ventilator was without complication, renal function recovered and homeostasis was re-established. The patient was discharged from the ICU on day 10 and from the hospital on day 30. One year later she was well without any signs of or long-term complications.

Discussion: Hysteroscopic myomectomy is a safe procedure with an overall risk of 0.75%. However, as this case demonstrates, it can result in severe irrigant fluid absorption with life-threatening hyponatremia and laryngeal swelling. The principle mechanism of fluid absorption is direct entry of the irrigating fluid into opened vessels. The amount of fluid absorption is influenced by the wound size and the resection time. The systemic inflammatory response syndrome with multiple organ failure most likely resulted from fluid overload, hypothermia and temporary hypoxemia.

Conclusions: Balancing the absorption of the irrigant fluid, limiting intrauterine pressure, measuring sodium values and clinical observation are means to help prevent these potentially life-threatening complications. It is recommended that the procedure is terminated when the estimated fluid absorption is between 1000 and 2000 ml.

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Emergency surgical pericardiocentesis and internal cardiac massage for asystole due to pericardial effusionL. Haesler¹, J.-C. Renggli², H. O. Zender¹*1 Service des soins intensifs, Département de médecine cantonale, Hôpital neuchâtelois – La Chaux-de-Fonds, La Chaux-de-Fonds, Switzerland; 2 Service de chirurgie, Département de chirurgie cantonale, Hôpital neuchâtelois – La Chaux-de-Fonds, La Chaux-de-Fonds, Switzerland*

Introduction: An unsuspected pericardial effusion was found in a 73-year-old woman who suffered a cardiac arrest after orthopaedic surgery. She responded to prompt pericardiocentesis and internal cardiac massage performed in our hospital by a non-specialist surgeon.

Case description: During hip replacement for oosteoarthritis, a fall in the patient's systolic blood pressure necessitated crystalloid infusions, autologous transfusions and finally noradrenaline. Rather than the pulmonary embolus we thought likely to be responsible, an urgent CT scan revealed a sizeable pericardial effusion. Two attempts at percutaneous pericardial drainage induced episodes of ventricular tachycardia with hemodynamic instability, and yielded only 10 ml of fluid. A subsequent sudden fall in blood pressure was followed by slow, pulseless electrical activity and finally asystole. While external cardiac massage continued, the surgeon removed a localized 40 ml clot from the pericardium and 600 ml of sero-sanguinous pericardial fluid via a subxyphoidal pericardiotomy. The heart remained inert, so he then commenced internal cardiac massage. That resulted in the prompt return of mechanically effective spontaneous beats after a total of 20 minutes asystole. Numerous investigations failed to reveal the reason for the patient's pericardial effusion. There were no other medical misadventures and she returned home a month after surgery, free of any unanticipated sequelae.

Conclusion: In the fewer than 250 articles concerning cardiac arrest secondary to pericardial tamponade we found in the literature, there was no report of emergency pericardiocentesis for spontaneous cardiac tamponade being attempted by a non-specialist surgeon. In trauma patients with cardiopulmonary arrest, emergency thoracotomy performed by trained surgeons, on-scene or in emergency departments, has a 10% survival rate (2 series, 70 patients). In many emergency situations, blind subxyphoidal pericardiotomy may well be a safer and more rapid method of treating acute haemopericardium than percutaneous catheter drainage, especially when performed by surgeons other than cardiopulmonary surgical specialists. It proved lifesaving in this case of cardiac tamponade due to effusion, despite asystole, (see also 6H and 5T in the ILCOR guidelines) and even though done by a non-specialist surgeon during cardiopulmonary resuscitation.

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ICU research: who should consent? Study about patients and relatives preferencesF. Gigon², C. Chenaud¹, P. Merlani¹, B. Ricou¹*1 Geneva University Hospitals, Geneva, Switzerland; 2 University of Geneva, Geneva, Switzerland*

Introduction: Informed consent (Ic) for research in ICU is controversial, even for conscious patients. Preferences of patients and relatives regarding its modalities were rarely investigated. We sought to explore whether they differed for patients and relatives according to the invasiveness of the study proposed/the consciousness of the patient.

Methods: Patient and relative's pairs were randomized to express their opinion about Ic's modalities for non-invasive (NIS, ie retrospective data extraction) or invasive studies (IS, ie prospective drug trial) after ICU discharge. Similar questions were addressed for conscious and unconscious patients.

Results: Of 553 eligible, 185 (33%) patients and 125 relatives (68%) responded. If conscious, most patients thought they were the person to be asked the Ic (NIS: 69/93 (74%); IS: 64/92 (70%)). For NIS, 7 (8%) thought the physicians could consent or that none was necessary, and 6 (7%) that the relatives could. If unconscious, the patients wanted the relatives to consent, depending on the invasiveness (NIS:

53 (57%); IS: 48 (52%), p = 0.01). ICU doctors were more sought in NIS (10 (11%) vs 0) whereas it was the family doctors for IS (13 (14%) vs 5 (5%)). 9 (10%) for NIS and 8 (9%) for IS choose waiving of consent. For conscious patient, most relatives thought patients were the person to be asked (NIS: 44/64 (69%); IS: 42/61 (69%)). Themselves came in 2nd position (NIS: 9 (14%); IS: 8 (13%)). For unconscious patients, 2/3 of relatives thought of themselves and then of ICU doctors (NIS: 9 (14%); IS: 8 (13%)). 1/3 of patients wanted a 2nd person to consent, and 48% if unconscious and IS. More relatives wanted a 2nd person to consent for IS than for NIS: for conscious: 36 (59%) vs 21 (33%) (p = 0.001); for unconscious: 37 (61%) vs 23 (36%) (p = 0.007), respectively. Rates of concordance in pairs were 64–80%. In emergency situation, less patients agreed that the study starts before the Ic for IS than for NIS: for conscious: 48 (52%) vs 63 (68%) (p = 0.04); for unconscious: 49 (54%) vs 61 (66%), respectively. 28 (46%)–44 (69%) of relatives thought the study could start, depending on consciousness and invasiveness. Most pairs agreed to consent in two steps, independently on consciousness or invasiveness (64–75%). **Conclusion:** Preferences regarding Ic for research were more protective with unconscious patients. For conscious patients, most pairs wanted the patient to consent. For unconscious patients, about half wanted the relatives to decide. The others wanted to defer Ic to physicians. Invasiveness impacted significantly.

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Le maintien des unités de soins intensifs dans les hôpitaux régionaux est-il défendable du point de vue de la performance?

Analyse des données de la fédération des hôpitaux vaudois (FHV)

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Introduction: La forte densité hospitalière suisse entraîne la multiplication d'unités de soins intensifs de petites et moyenne taille (<9 lits). Les données de la littérature montrent un intérêt de regrouper les compétences médico-techniques pour améliorer la prise en charge des malades pour certains aspects de la médecine intensive. Dans cette optique, le maintien d'unités régionales de petite taille ne peut se justifier que si leur fonctionnement s'accompagne de performances appropriées. Parmi les indicateurs d'efficacité proposés dans la littérature, l'analyse combinée du taux de mortalité standardisée (SMR) et du taux standardisé d'utilisation des ressources (SRU) selon le modèle de Rothen et al. présente l'avantage d'une grande simplicité d'acquisition et permet la comparaison des unités entre elles.

Méthode: Pour 5 unités de soins intensifs de Suisse Romande (39 lits) partageant la même base de données et ayant des caractéristiques comparables (typologie des patients, plateau médico-technique, organisation médicale et infirmière), le SMR et le SRU ont été calculés à partir du score SAPS II, de la durée de séjour effective et de la mortalité hospitalière pour les malade ayant séjourné entre janvier 2007 et mars 2009. Ces données ont été ensuite reportées dans un graphique de performance à deux dimensions, selon le modèle de Rothen.

Résultats: 3960 patients ont été inclus dans l'analyse et 13 000 journées ont été comptabilisées. L'analyse de l'ensemble des patients pris en charge dans les 5 unités montre un SMR et un SRU inférieurs à 1. Le rapport entre la mortalité prédite et la mortalité observée est inférieur à 1 dans toutes les classes de gravité. Les valeurs isolées pour chaque unité sont très similaires, avec une variation minimale entre les unités. Les résultats ne sont pas modifiés par l'exclusion des patients transférés dans d'autres unités, notamment universitaires. En comparaison avec la cohorte SAPS III, les unités étudiées peuvent être considérées comme efficaces.

Conclusion: Cette analyse d'efficacité du fonctionnement de 5 unités comparables du canton de Vaud sur une durée de plus de 2 ans montre des résultats rassurants quant à la performance en terme de mortalité et d'économies. Ce travail pourrait inciter d'autres unités à pratiquer un benchmarking sur le plan régional ou sur un plan plus large en utilisant ces indicateurs. L'adoption du SAPS 3 et sa calibration au niveau national par la SSMI permettrait une avancée dans ce domaine.

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McCabe score as determinant of hospital mortality of septic shock

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Despite continuous progress in the management of septic shock, it is associated with a high mortality. However, we suspected that hospital mortality may be influenced by the predicted outcome of comorbidities and by the origin of the infection.

Methods: We analysed hospital-related mortality of all patients with a septic shock consecutively admitted in our 32-beds mixed university ICU from 2005 to 2008, according to both the origin (community-acquired or nosocomial) and to the underlying McCabe and Johnson score (non fatal, fatal within 5 years, fatal within 6 months). Data are extracted from the clinical information system (Metavision[®]) and combined with a database on case-mix used to provide information to the «Minimal dataset» of the SGI/SSMI. Following discharge, diagnostic are prospectively validated by the attending physician and further imported in the institution datawarehouse (Teleform[®]) after final crosschecking.

Results: A total of 8979 patients, accounting for 9641 stays were admitted from January 2005 to December 2008. A septic shock was diagnosed in 910 cases, community-acquired and nosocomial in 551 and 358 cases (39.3%), respectively. The McCabe score was nonfatal, fatal within 5 years and fatal within 6 months, in 44.6%, 38.5% and 16.9% of stays, respectively. Overall hospital mortality was

37.0%, 31.1% and 46.0% for all episodes, for community-acquired and nosocomial septic shock, respectively. It was 23.9%, 36.9% and 73.1% for McCabe nonfatal, fatal within 5 years and fatal within 6 months, respectively. Hospital mortality according to the McCabe and to the origin of the septic shock is displayed in figure.

Discussion: The overall mortality of septic shock remained high in our referral mixed ICU. McCabe score was a stronger determinant than the origin of the septic shock. Mortality decreased significantly from 73% if nosocomial in patients with an underlying condition scored as potentially fatal within the next 6 months to 20% when community-acquired in a patient with non fatal underlying disease.

Conclusion: The McCabe/Johnson score and the origin (community-acquired or nosocomial) are strong determinant of the outcome of septic shock.

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Unidirectional Networking From Small To Large Intensive Care Units In Switzerland

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Introduction: Due to the demographic evolution of the population, the increasing polymorbidity of patients and limited intensive care unit (ICU) bed availabilities, there is an increasing need for networking between large and small ICUs.

Objectives: To investigate the need and directors' willingness of establishing a network of ICUs in Switzerland with regard to patient allocation as well as postgraduate training and continuing medical education (CME) of ICU physicians.

Methods: A questionnaire containing 19 questions and illustrations of 7 clinical situations was sent to the medical directors of all ICUs accredited by the Swiss Society of Intensive Care Medicine (SSICM). The 19 questions were divided in three parts: The first section was designed to obtain information on the organization and structure of the ICU. The second identified criteria for patients' transfer in several clinical conditions. The third investigated the actual and possible future practice of postgraduate training and CME of ICU physicians.

Results: Of 92 questionnaires sent, 28 were returned, providing a 30% response rate. 7 (25%) were small ICUs (<= 6 beds), 14 (50%) medium sized ICUs (7-9 beds), 5 (18%) large ICUs (>= 10 beds). In 2 answers, the size of the ICU was missing. Most ICUs of small and medium size perform 1-5 patients' transfers per month, large ICUs perform less (<1 per month). 73% of transfers are performed due to medical reasons, preferentially acute respiratory failure (acute lung injury (ALI) or acute respiratory distress syndrome (ARDS)) and shock. However, small ICUs tend to keep post-surgical patients and patients with early ALI/ARDS and have considerable reservations against transferring a potential organ donor. Large ICUs are willing to accept any kind of pathologies, preferentially patients with shock and ALI/ARDS. Further reasons for transfer are lack of ICU beds, infrastructure and personnel. Current postgraduate training and CME programs are network based in 85% of all ICUs. Of the small/medium sized ICUs, 42% include a large ICU in their CME network, whereas the remaining are organized within a regional network of small/medium sized ICUs.

Conclusions: The results of the survey indicate that networking for patients' care between ICUs is limited and mostly unidirectional from small/medium sized to large ICUs. Conversely, there is considerable networking with regard to postgraduate training and CME of ICU physicians.

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Critical Care lead Medical Emergency Team: a 10 months experience in a University Hospital in Switzerland

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Introduction: Patients admitted in Intensive Care Unit (ICU) from general wards are more severe and have a higher mortality than those admitted from emergency department as reported. The majority of them develop signs of instability (e.g. tachypnea, tachycardia, hypotension, decreased oxygen saturation and change in conscious state) several hours before ICU admission. Considering this fact and that warning signs may precede in-hospital cardiac arrests and unexpected death, urgent intervention by specialized team may be effective.

tive. This prompted medical emergency team (MET) implementation which have been shown to decrease cardiac arrest, morbidity and mortality in several hospitals.

Method: Implementation of a MET, including an intensivist and a critical care nurse, and an intermediate care staff education, were effective in July 2008. The system was first active in 3 intermediate cares (visceral and thoracic surgery, cardiology) and extended progressively (neurosurgery, otolaryngology). Each working day from 8 am to 18 pm, based of defined criteria of physiological disturbance (table 1), the MET can be called by a nurse or a physician. The MET is at the unstable patient bedside within 10 minutes, where acute management can stabilize the patient. The patient is either promptly admitted to ICU or maintained in the intermediate care, thus preventing a further ICU admission.

Results: During the first analysed period of 7 months, the MET was called 43 times (22 patients in intermediate care of visceral surgery, 6 in thoracic surgery, 9 in cardiology, 4 in neurosurgery and 2 in other). 28 patients (65%) were admitted to the ICU and 15 could stay in intermediate care (figure 1). The qualitative assessment by either ICU or intermediate care staff is good.

Conclusion: A step by step implementation of MET in a University Hospital is feasible, with no major ICU activity disturbance. Despite very easy MET access, the number of interventions are quite low possibly reflecting the usual medical practice and the difficulties of new systems implementation in the different intermediate cares in our institution.

Table 1

	Criteria for MET call
Heart rate	<40/min or >140/min
Systolic blood pressure	<90 mm Hg
Respiratory rate	<10/min or >30/min
Decreased oxygen saturation	<90% with O ₂ supplementation
Change in conscious state	
Decreased urine output	<50 ml within 4 hours
Caregivers concern	

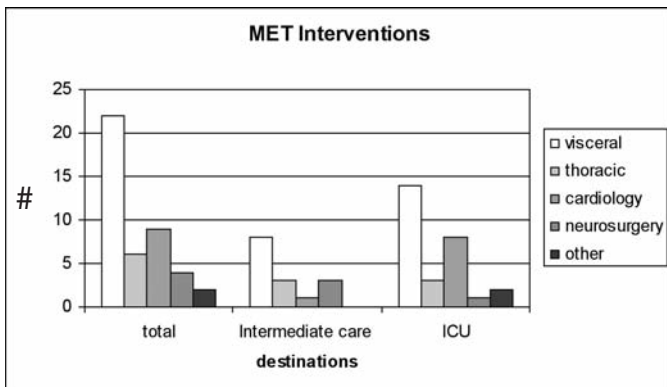


Figure 1

Delay for admission of unstable hospitalized patients to Intensive Care Unit: a need for a Medical Emergency Team?

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Introduction: Patients admitted in Intensive Care Unit (ICU) from general wards are more severe and have a higher mortality than those admitted from emergency department as reported [1]. The majority of them develop signs of instability (e.g. tachypnea, tachycardia, hypotension, decreased oxygen saturation and change in conscious state) several hours before ICU admission. Considering this fact and that in-hospital cardiac arrests and unexpected deaths are usually preceded by warning signs, immediate on site intervention by specialists may be effective. This may justify implementation of medical emergency team (MET), which has been recently shown to decrease cardiac arrest, morbidity and mortality.

Methods: In order to explore if the same was true in our hospital and to determine if there was a potential need for MET, we prospectively analysed all non elective ICU admissions of hospitalized patients (general wards) and of patients staying for more than 3 hours in emergency department (considered hospitalized). Instability criteria leading to MET call are listed in table 1. The delay between the development of one criterion and ICU admission was registered.

Results: During 8 months, 222 patients with our MET criteria were admitted to ICU. 52 patients (23%) came from the emergency department, 86 (39%) from the surgical and 84 (38%) from the medical ward. Among these 222 patients, 63% were male. The median age was 66 years (range 19–87). The delay from MET criteria development to ICU admission was higher than 8 hours in 117 patients (53%), with a median delay of 32 hours and a range of 8.4 to 480 hours. For the remaining 105 patients, an early MET criterion was present up to 8 hours (median delay 3.5 h) before ICU admission. These results are quite concordant with the data reported in the literature [1–6].

Conclusion: Similar to others observations, the majority of hospitalized patients admitted on emergency basis in our ICU have warning signs lasting for several hours. More than half of them were unstable for more than 8 hours. This shows there is plenty of time for early acute management by dedicated and specialized team such as MET. However, further studies are required to determine if MET implementation can reduce in-hospital cardiac arrests and influence the morbidity, the length of stay and the mortality in our institution.

1. K.-H. Hillman et al. ICM. 2002;28:1629–34.
2. R Bellomo, et al. CCM. 2004;32:916–21.
3. R. Bellomo, et al. Med J Aust. 2003;179:283–7.
4. DeVita M, et al. CCM. 2006;34:2463–78.
5. BD Winters, et al. CCM. 2007;35:1238–43.
6. MA Peberdy, et al. Circulation. 2007;116:2481–500.

Table 1

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Caregivers concern	

Système de report volontaire et anonyme d'événements indésirables en soins intensifs: une expérience de 7 ans

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Introduction: La pratique de la médecine intensive comporte un risque élevé de complications. La garantie de la sécurité implique la surveillance des complications et la prévention de leur survenue. Nous avons opté pour la participation volontaire des professionnels dans le maintien de la sécurité.

Méthode: Un système de déclaration d'événement indésirable (EI) développé en 2002 dans les soins intensifs (ICU) de médecine, puis étendu dès mai 2005 aux ICU chirurgicaux se déroule ainsi: 1. déclaration volontaire, anonyme par tout professionnel, des complications et situations dangereuses, sur un formulaire de déclaration (FD); 2. récolte des FD; 3. classement et analyse des EI avec proposition de modifications et suivi des actions correctrices et préventives; 4. information de la direction et des équipes ICU.

Résultats: Le nombre d'EI est en moyenne de 307.7/an (extrêmes 222–444) dans les ICU médicaux, puis de 525.25/an (extrêmes 414–621) dans les 2 ICU. Il existe une grande variabilité au cours des mois, allant de <10 à 120 EI /mois. Les FD sont remplis essentiellement par les infirmières. En 2008, les FD sont faits par les infirmières (83%), les médecins (8%), les physiothérapeutes (5%), les aides soignants (3%). Il n'y a pas de grandes modifications sur le type d'EI, qui concernent essentiellement les traitements et médicaments, les soins, le matériel et la logistique, mais rarement l'asepsie. En 2008, les 595 EI se répartissent ainsi: 26% traitement et médicaments, 22% matériel, 18% logistique, 11% soins, 4% aseptie, 2% nutrition. De nombreuses actions ont été entreprises: étiquetage, double vérification avant administration de médicaments à risque (insuline-héparine), procédure pré-extubation, modification des pratiques pour les lanières et les masques de ventilation non invasive. Ce système a permis de détecter de nombreux EI et à améliorer la qualité, tant par les actions préventives mises en œuvre que par la stimulation de

chacun à détecter les situations à risque. En conformité avec la littérature, les infirmières sont plus compliantes que les médecins avec les FD.

Conclusion: Ce système de déclaration et de gestion des EI en ICU a permis de détecter et de prévenir de nombreux risques. Une participation de tous les professionnels, y compris des médecins est indispensable pour garantir une meilleure sécurité. Un concept global de sécurité, basé sur le système actuel, sera développé, afin de professionnaliser la gestion des risques dans l'ICU.

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Ulcérations cutanées du visage après ventilation non invasive imposant la modification de multiples processus: utilité d'un système de gestion des risques dans un service de médecine intensive

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Introduction: L'identification et l'analyse systématique des complications et des situations potentiellement dangereuses (événements indésirables: EI) sont indispensables pour garantir la qualité des soins et la sécurité des patients en soins intensifs.

Méthodes: Un système de recueil des EI existe dans le service depuis plusieurs années. Les circonstances de survenue des EI sont systématiquement analysées selon le modèle des causes organisationnelles des incidents (James Reason), avec examen des processus fautifs (erreur ou infraction) et des facteurs contributifs liés aux patients, au matériel, aux tâches et processus, aux individus, à l'équipe, au travail, à l'environnement et à l'organisation institutionnelle. Ceci permet la correction des facteurs incriminés et un suivi des EI comme indicateur d'efficacité.

Résultats: Notre système de report d'EI a révélé la survenue chez 15 patients d'ulcérations du visage (joues, nuque, cou, racine du nez) après ventilation non invasive (VNI), se situant sur les trajets des lanières de fixation et les points d'appui des masques de VNI. L'analyse a montré de multiples facteurs responsables: la réutilisation de lanières à usage unique, l'achat de nouvelles lanières par la Centrale d'Achat (CA), une information insuffisante aux professionnels (PRO) chargés de la désinfection, la décision de l'Hygiène Hospitalière (HH) d'utiliser un désinfectant plus concentré, l'absence d'adaptation du temps de trempage (variable 1 à 12 heures), l'interprétation individuelle du mode de rinçage (toxique persistant sur les lanières et masques), des directives de HH inadéquates à l'organisation du travail des PRO, des interférences externes (HH, CA) dans l'organisation du service. Suite à la modification de l'ensemble des processus sus-décrits, aucune nouvelle lésion cutanée n'a été rapportée après VNI. L'information sur les dangers d'interférences externes dans le service et une attention particulière à la communication lors de l'introduction de nouveautés (matériel, procédures, produits, médicaments) devraient contribuer à éviter la survenue de tels EI.

Conclusions: Le signalement d'ulcérations cutanées du visage chez 15 patients après VNI et l'analyse particulièrement complexe des causes organisationnelles de ces EI ont révélé des dysfonctionnements à plusieurs niveaux. Les corrections apportées se sont avérées efficaces, quant aux lésions cutanées, mais pourraient encore être améliorées quant aux collaborations avec les services externes.

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Praxisentwicklung: Schlafförderung auf der Intensivstation

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Hintergrund: Regelmässiger Schlaf dient der Erholung und Regeneration von Körper und Geist und beeinflusst Immunabwehr, Gedächtnis und Muskelfunktionen positiv. Schlaflosigkeit wurde als starker Stressfaktor identifiziert und gilt als auslösender Faktor für die Entwicklung eines Delirs. Mehr als die Hälfte der Patienten in kritischem Gesundheitszustand leiden an Schlafstörungen. Operative Interventionen, Entzündungen, Lärm, Schmerzen, Beatmung, Medikamente und auch Pflegeinterventionen werden als Störfaktoren genannt. Auch auf der Intensivstation im Kantonsspital Baden fühlen sich die Patienten durch verschiedene Einflussfaktoren in ihrem Schlaf gestört. Als Jahresziel 2007 wurde daher vom Pflegeteam formuliert, gezielte Pflegeinterventionen zur Schlafförderung in der Praxis anzuwenden.

Methode: Projektarbeit: Literaturrecherche und gezielte Weiterbildung zum Thema, Überprüfung der klinischen Erfahrungen durch Befragung von 30 Patienten und das Sichten ihrer Pflegedokumentation. Es zeigten sich Lärm (n10), Angst (n9), Schmerzen (n9), Licht (n8), Lagerung (n6) als häufigste Störfaktoren. 25% der Patienten schliefen auch tagsüber und jeder zweite Patient klagte über einen veränderten Tag-Nacht-Rhythmus. Aufgrund dieser Analyse wurde ein Pflegekonzept zur Schlafförderung mit inter-disziplinärer Zusammenarbeit erstellt. Es folgte die gezielte Weiterbildung des Pflegeteams und eine kontinuierliche Praxisbegleitung bei der Umsetzung.

Ergebnisse: Von den Pflegenden werden aufgrund der Schlafanamnese und der potentiellen Störfaktoren gezielte Massnahmen durchgeführt. Dazu gehören z.B. eine Atemstimulierende Einreibung im Spätdienst, Mikrolagerungen während der Nacht oder die Förderung von Tagesaktivitäten. Die Überprüfung der Umsetzung geschieht laufend anhand von Patientenbesprechungen, Teamweiterbildungen, Kontrollen der Pflegedokumentationen und Einzelberatungen. Es zeigt sich hier, dass ein Grossteil des Pflegeteams dieses Pflegekonzept sehr motiviert und engagiert in die Praxis umsetzt. Als fördernde Faktoren werden zufriedene Patienten und ruhigere Nächte, als hindernde Faktoren Zeitmangel oder niedere Prioritätsstufe genannt. Die Überprüfung der Wirksamkeit erfolgt bei 30 Patienten in den Monaten April – Juni 2009 durch Befragung und das Sichten ihrer Pflegedokumentation. Erste Ergebnisse zeigen, dass bei etwa 50% der Patienten schlaffördernde Interventionen durchgeführt werden und dass die oben genannten Störfaktoren vermindert werden konnten.

Schlussfolgerung: Durch schlaffördernde Pflegeinterventionen wird die Zufriedenheit von Patienten und Pflegenden erhöht.

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Die Ermittlung von Wissen und Können zur Entwicklung effektiver Weiterbildungsmassnahmen am Beispiel der perkutanen Wirbelsäulenfusion in der Neurochirurgie

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Die Weiterbildung ist von zentraler Bedeutung für die Neurochirurgie. Dies insbesondere vor dem Hintergrund tiefgreifender Veränderungen im Gesundheitssystem. Technologische Innovationen, Kostendruck und geringer werdende Zeiterressourcen bedingen neue Anforderungen an Qualifizierungsmassnahmen. Eine arbeitspsychologisch fundierte Analyse des handlungsleitenden Wissens und Könnens sowie die Gestaltung lernpsychologisch optimierter Lehr-Lern-Situationen stehen jedoch noch aus. Ebenso zentral in diesem Zusammenhang ist die systematische Evaluation der Weiterbildungsmassnahmen. Anknüpfend an die Bestrebungen der europäischen Fachgesellschaft UEMS (European Union for Medical Specialists) hinsichtlich Harmonisierung und Standardisierung der Weiterbildung, stellen sich folgende Forschungsfragen:

1. Welches Können ist handlungsleitend und leistungsrelevant?
2. Wie kann dieses Können optimal vermittelt werden?
3. Wie kann durch Werkzeugegestaltung der Aneignungsprozess unterstützt werden?
4. Wie kann das Erlernte stabilisiert, die Weiterbildungszeit reduziert und die Qualität der Weiterbildung optimiert werden?

Zur Untersuchung dieser Fragestellungen wurde exemplarisch die Operationstechnik der perkutanen Wirbelsäulenfusion ausgewählt. Diese stützt sich auf eine Arbeitsanalyse, wobei mehrere arbeitspsychologische Methoden angewendet wurden. Damit verbunden ging es um die Überwindung des Analyse- und Bewertungsproblems der Mensch-Instrumente Schnittstelle sowie des individuellen Lernfortschritts. Hierfür wurde eine computergestützte Beobachtungsmethode entwickelt. Erste Ergebnisse der Studie erlauben folgende Einschätzung: AnwenderInnen der Operationstechnik unterscheiden sich bei vergleichbarem Ausbildungsstand qualitativ sowie quantitativ hinsichtlich ihres Wissens und Könnens. Basierend auf einem tätigkeitstheoretischen Modell ermöglicht die systematische Beobachtungsmethode die Beschreibung des Operationsverlaufs sowie des Lernfortschritts sowie die Bewertung des verwendeten Instrumentariums. Hieraus lassen sich Problembereiche der individuellen Aneignung dieser Operationstechnik aufzeigen und Handlungsbedarf für Arbeitsgestaltungsmaßnahmen sowie für die Gestaltung von Lehr-/Lernprozessen ableiten. Mit dem Ziel, die effektivsten Weiterbildungsmassnahmen auszuwählen, können auf Basis dieser Vorarbeiten künftig Weiterbildungsmassnahmen fundiert konzipiert, evaluiert und kontinuierlich weiterentwickelt werden.

Abu-Isa J 9 S
Andereggen L 3 S, 8 S
Auinger K 18 S

Berkmann S 18 S
Bonassin F 16 S
Bostelmann R 14 S

Coluccia D 12 S
Copin JC 9 S

Eggimann P 21 S
Ewelt C 10 S, 12 S

Forni V 17 S
Franzen D 5 S
Fung CF 18 S

Gigon F 20 S

Haesler L 20 S
Heimgartner K 23 S
Hidalgo Staub ET 4 S
Huser M 11 S

Jeitziner M-M 3 S
Joseph C 22 S, 23 S
Jotterand C 2 S, 6 S

Kamp MA 13 S
Khouidi DK 7 S
Kirsch EC 14 S
Kistler A 19 S
Klarer A 21 S
Kothbauer KF 2 S
Kreienbuehl L 19 S

Mädler S 11 S
Marbacher S 4 S, 10 S
Mono ML 12 S
Mordasini P 8 S, 11 S

Noveanu M 6 S

Oddo MO 2 S
Ostendorp CP 23 S

Pagani JL 21 S, 22 S
Perren A 14 S, 15 S
Piquilloud L 5 S, 16 S

Rieke A 4 S
Rienmüller A 10 S

Salvadè I 5 S
Schneider A 7 S, 15 S
Soguel L 17 S
Stieglitz LS 2 S
Stippich C 12 S, 13 S
Stover JF 6 S, 9 S

Tagan D 21 S
Tahsim-Oglou YT 9 S

Urbano LA 19 S

Vignaux L 5 S
von Arx-Strässler F 7 S

Wegmueller B 20 S
Wehrstedt A 13 S
Wenger U 16 S
Winkler K 3 S, 18 S