

17th Annual EMN Congress Cluj-Napoca, Romania

27th – 28th of April, 2012

The scientific program of EMN 2012 offered lectures and discussions with renowned experts and focus on:

- a) Craniovertebral pathologies
- b) Assessment of quality of life
- c) Neuroprotection acute and chronic
- d) Advances in neurotrauma
- e) New methods in motor and competitive rehabilitation
- f) Free papers

Prof. Dr. Ioan Stefan Florian was the Congress President of 17th Annual EMN Congress, Cluj-Napoca, Romania, April, 27-28, 2012.

The congress was attended by numerous foreign guests and romanian neurosurgeons, including the presence of EMN President, Prof. Dr. Wolf-Ingo Steudel, CEO Saarland University Medical Center Homburg, Germany.

ABSTRACTS

POSTTRAUMATIC SYRINGOMYELIA

– ABOUT CAUSE AND TREATMENT

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Introduction: Syringomyelia is caused by a disturbance of cerebral spinal fluid (CSF) flow. Causal treatment requires that the exact location of this disturbance be identified by imaging. Cardiac-gated phase-contrast magnetic resonance imaging (MRI) is an effective tool for this purpose. A traumatic lesion of the arachnoid does not necessitate a spinal cord injury. We investigated the question of whether every

cause of posttraumatic syringomyelia requires surgery.

Material and methods: From 2001 to 2009, cardiac-gated phase-contrast MRI of the skull and the whole spine was used to detect the site of CSF obstruction in 693 patients with syringomyelia (417 women, 276 men; mean age: 38.5 years, range: 1–79 years). CSF flow is demonstrated in the craniocaudal direction in a strictly median sagittal plane.

Results: 34 patients (7 women, 27 men) had a posttraumatic syringomyelia. 6 patients had after the trauma no neurological deficit. Time between injury and diagnostic was in mean 8 years (0.5 to 29 years). There is no correlation between level of the spinal cord injury and the extension of the syringomyelia. With CSF pulsation imaging the adhesions are

identified.

Chiari malformation was the most common cause of syrinx formation (154 patients). A total of 93% of the patients with Chiari I malformation underwent surgery.

Conclusions: The level of the adhesion which causes the syringomyelia cannot be identified without cardiac-gated phase-contrast MRI. In these cases, causal treatment cannot be given without cardiac-gated phase-contrast MRI if surgery is needed. Not all patients with posttraumatic syringomyelia require surgery.

DO THE CALPAIN INHIBITORS AND HEPATOCYTE GROWTH FACTOR HAVE AN EFFECT IN SPINAL CORD INJURY?

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Objectives: The pharmacological effects of calpain inhibitors and hepatocyte growth factor (HGF) have been extensively described but from our knowledge there are no studies to evaluate the association of these two drugs in spinal cord injury (SCI).

Methods: Fifty albino Wistar rats were used for the study. The animals were divided into five groups: in group I (sham operated group) only laminectomy was performed; the rats from group II-V underwent traumatic SCI by using clip-compression model and they received the following substances: group II received calpain inhibitor VI, group III received hepatocyte growth factor (HGF), group IV

received a combination of calpain inhibitor VI and HGF; the control group (VI) received dimethyl sulfoxide (DMSO) only. The motor recovery of the animals was evaluated using the Ferguson et al. modification of the BBB scale. After seven days the rats were sacrificed.

Results: We found no statistically significant differences between the control group and the groups that received the two substances, alone or in combination regarding the motor recovery ($p > 0.05$).

Conclusion: There are no drugs capable of targeting directly the nervous tissue after the spinal cord injury. The treatment with Methylprednisolone has improved the long term recovery as shown in different studies, but the results remain modest. From our experience the calpain inhibitor and HGF had no clinical benefits. More studies are mandatory to ascertain the benefits of the drugs for both acute and chronic SCI.

Keywords: spinal cord injury, calpain inhibitors, hepatocyte growth factor.

PREHOSPITAL AND EARLY IN-HOSPITAL TREATMENT OF TBI – STUDY FROM AUSTRIA

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Introduction: International Neurotrauma Research Organization has 12 years of experience in quality of care, patient outcome and comparative effectiveness research in the area of brain trauma.

Aims of study: We investigated early management of patients after TBI in

Austria.

Methods: Between 4/2009 und 4/2010 we have enrolled 16 Austria centers into an observational study of prehospital and early in-hospital care of TBI and collected data on 446 patients. The study was funded by the Ministry of Health and the AUVA (Austrian Trauma Insurance). For each patient we have collected data on Prehospital status & treatment, Status & treatment in Trauma Room, Times of trauma, ambulance pick up, hospital/ ICU admission and discharge/death, ICU treatment summary, Hospital & 6-months outcome. For each patient we have calculated Intervals (EMS-Hosp; Arrival-CT, CT-OR, etc.), Probability of mortality and Probability of poor outcome.

The study is a part of a 5 year project (2008-2012), with interim analysis at half-time, described in this presentation.

Results: Severe TBI had 2/3 of patients. Overall hospital mortality was 31.8%. Factors associated with significantly increased mortality were age > 50 years, poor neurological status, higher trauma severity, pre-existing illness and use of anti-thrombotic medication.

Conclusion: In prehospital setting, use of capnography and pulse oximetry and use of hypertonic saline were associated with lower O/E ratios. In in-hospital setting, administration of CT scan within 10 minutes of hospital admission, start of neurosurgery within 30 minutes of hospital admission and use of optimizing coagulation were factors associated with lower O/E ratios.

EXPERIENCES USING MOBILE NEAR-IRRED-SPECTROSCOPY SYSTEMS FOR NONINVASIVE DETECTION OF INTRACRANIAL HEMATOMA

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Objectives: Early recognition of intracranial hematoma strongly influences the sequelae of patients after traumatic brain injury. Three different mobile laser optic systems for quick diagnosis were tested for the ability to detect traumatic intracranial hematoma.

Method: Patients after traumatic brain injury were examined using one of the near-infrared spectroscopy systems (CRAINSCAN; Infrascanner 1000 or Infrascanner 2000) and the results were compared to the corresponding CT or MRI imaging.

Results: Intracranial hematoma were detectable in 67% of the cases. The absence of any hematoma was correctly shown in 69% of the patients.

Conclusions: Unilateral hematomas underlying the calvarian bone are detectable in a safe manner if artificial factors are absent. The positive predictive value is low in patients with severe skull injury. Bilateral bleeding is not detectable. The system is helpful in continuous monitoring of patients with mild to moderate skull trauma, especially of those without relevant soft tissue damage.

The computed tomography can not be replaced by nearinfrared-spectroscopy-systems.

INFRASCANNER IN THE DIAGNOSIS OF INTRACRANIAL DAMAGE IN CHILDREN WITH TRAUMATIC BRAIN INJURIES

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The aim: To estimate the efficiency of using the Infrascanner Model 1000 scanner during the diagnosis of intracranial hemorrhages among children with mild traumatic brain injuries.

Materials and Methods: The basis for this study consisted of 95 patients with mild traumatic brain injuries. All the patients underwent a standard examination under the conditions in place in the emergency department which included a checkup by a neurosurgeon and cranial radiographs. Computed tomography was performed on 43 patients (45%), while 52 patients (55%) with a low risk of intracranial damage were placed under dynamic observation. The neurosurgeon on duty performed a near infrared scan using the Infrascanner.

Result: One of the most significant conclusions arising from our work concerns the high sensitivity and specificity of the Infrascanner during the determination of hemorrhagic foci. The instrument's specificity reaches 0.91, while its sensitivity reaches 1.00 (0.89; 1.00).

The experience acquired during our work made it possible to define the Infrascanner's capabilities for this category of injured persons. It is obvious that such an examination was not very effective

among children up to 2 years of age. This still leaves the problem of the damage (contusions) of the soft tissues of the skull cap that also accompany traumatic brain injuries. The infrascanner's high sensitivity and specificity relative to the occurrence of an extravasal accumulation of blood when even small lesions are present in the soft tissues frequently constitute the reason for what is called a false-positive response. Furthermore, taking the high specificity and sensitivity of the technique into account, together with the simplicity of its use, the result obtained makes it possible to view the Infrascanner as a screening technique for the diagnosis of intra-cranial hemorrhages during initial specialized medical care.

THE EVACUATION OF A NEUROSURGICAL WARD IN THE TERRORISTIC MENACE – POINT OF VIEW OF A NEUROSURGICAL RESIDENT

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Introduction: The 16 th of July 2007 at 1 p.m. the editorial office of the Neu-Ulmer Zeitung received a message by telephone, that at 3 p.m. seven bombs will explode in the military hospital of Ulm. This message was classified by the police as serious. Therefore we decided to evacuate the entire hospital.

Result: In our department we we had to evacuate 31 patients (3 in the operation theatre, 22 who could walk, 1 lying in bed, 4 in wheelchair). Within 55 mins we had 10 persons (4 doctors, 5 nurses, 1 secretaire) to

evacuate all the patients from the 6th floor to the ground level. We transferred the patients to different reception centers. That day we had very good weather conditions. The transport back to the hospital started 8 hours later.

Conclusion: The evacuation of a hospital in the terrorist menace is a very difficult situation for the patients and the coworkers. This catastrophic situation can not be planned or calculated. The success of this evacuation was realized by the improvisation, the very high motivation and the flexibility by all coworkers. The very good cooperation in the hospital, the hospitals around, the firemen, the police, the soldiers and the emergency medical services was the fundamental base of the fast evacuation.

OPERATIVE DECISION AND FOLLOW-UP USING PHASE-CONTRAST MRI IMAGERY IN CRANIAL AND SPINAL PATHOLOGIES AFFECTING CSF FLOW

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Modern-day neurosurgical practice benefits consistently from new and remarkable neuroimaging tools, especially by magnetic resonance. Nevertheless, most of those fail to assess some essential physiological central nervous system processes like the cerebrospinal fluid circulation. The pathological loop of initial structural anomaly affecting the CSF dynamics which further enhance the parenchymal damages is well documented in the literature. Cine Phase-Contrast MRI

is a reliable and non-invasive method that allows the visualization and measurement of cerebrospinal fluid flow throughout the intracranial and spinal compartments. It has become available in our neurosurgical center since 2007. We found it successfully applicable in a wide range of neurosurgical pathologies which at some point interfere with the normal flow dynamics. In this work we show how carefully conceived cine Phase-Contrast studies can prove to be not only a valuable complement, but a decisive component in some problematic or equivocal clinical situations where other neuroimaging methods are inconclusive.

PRINCIPLES OF TREATMENT SEVERE TRAUMATIC BRAIN INJURY IN CHILDREN

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Since 2003 in our Institute the basic principles of treatment sTBI strategies were formulated according to contemporary recommendations. The aim of our research is to evaluate the efficiency of treatment for children with combined and isolated sTBI. We studied 129 children with sTBI (GCS \leq 8). 58% of them had combined trauma. Statistical analysis of 230 parameters revealed significant factors for prognosis of severe TBI outcomes.

There are:

- 1) mydriasis ($p = 0.0019$),
- 2) GCS level ($p < 0.05$),
- 3) hypoxia ($pO_2 < 60\text{mmHg}$) ($p < 0.05$),

4) hypotension (cystolic BP < 90) ($p < 0.05$),

5) intracranial pressure > 26 mm Hg. for more than 30 minutes,

6) Marshal scale 3, 4 and 6 ($p < 0.05$),

7) ISS 45 ± 4 in groups with GCS = 6-8 score. There was not significant influence of ISS on outcomes in the groups of combined injuries with GCS = 3-5 score.

Prospects for improving outcomes for children with severe combined or isolated TBI we associate with early restoration and maintenance of vital functions, early identification and elimination of damage which complicate general vital functions, followed by early restoration of anatomical arrangements. Under these conditions, the fundamental importance is the maintenance of “physiological corridor” (vital functions) under the multi-modal monitoring control. The monitoring of intracranial pressure must be used as a important criterion for determining for the method of treatment.

NON-INVASIVE ICP MONITORING?

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Introduction / Objective / Objectives:

ICP registration is a valuable but invasive tool for observation of the intracranial situation after traumatic brain injury. Together we developed several methods for non-invasive observation of the pressure curve. This gives a signal curve like ICP by the electrical signal change on lateral electrodes at the skull by the change of the relation between blood, brain and CSF during the cardiac cycle.

Patient and methods / Material and methods / Methods / Purpose

Now we used within the closed external meatus acusticus a pressure registration which gives the transmitted information of intracranial pressure through the aqueductus cochlea.

22 patients (17 NPH, 2 SAB, 1 ICB, 2 intraventricular hemorrhage) were observed during invasive (17 epidural, 5 intraventricular) ICP registration, 17 of them had a lumbar infusion test to determine a normal pressure hydrocephalus.

The 14 volunteers were observed in different positions on a tilting table.

Results / Result: In 73% of the patients and 94% of the volunteers the ICP change was recognizably. The highest curve peak was earlier in enlarged ICP. The curve shape give some information about the ICP level

Conclusion / Conclusions: Reported by Wloydka 1978 it may be that after the age of 40 years the Aqueductus cochlea occluded in 50%. And no measurement is possible by this method. Like in other experience a high sensitivity to patient movement causes a lot of artifacts. The primary curve and situation has a high interindividual change. The method allows no zero point estimation and therefore there is a loss of objective value of the registration which may be excluded by Fuzzy logic. Although these methods allow an orientation of intracranial pressure course.

FIBERENDOSCOPIC AIRWAY MANAGEMENT DOES NOT COMPROMISE HAEMODYNAMIC STABILITY OR GAS EXCHANGE

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Securing the airway of patients with cervical spine injury requires a technique compatible with the tenet *primum nihil nocere*. Laryngoscopic endotracheal intubation may jeopardize integrity of the cervical spine, which cannot be prevented by stabilizing collars reliably [1]. Nasotracheal fiberoptic intubation under local anaesthesia obviates the need for direct laryngoscopy and was proven safe for the neurosurgical patient [2]. Waiving mask ventilation and general anaesthesia may, however result in hypoxia, hypercapnia or hypertension, particularly undesirable in patients with associated TBI. We have assessed effects of airway management techniques on heart rate, blood pressure and blood gases in patients presenting for elective craniotomy.

Methods: Informed consent was obtained from 100 consecutive patients undergoing intracranial procedures. 50 patients each were randomly allocated to one of two groups. Patients in group one received laryngoscopic orotracheal intubation following denitrogenation and induction of general anaesthesia (GA), patients in group two were intubated nasotracheally with a flexible fiberbronchoscope under local anaesthesia ("spray-as-you-go") and oxygen insufflation (3 L/min via nasal prong) (LA). Patients in both groups received midazolam 3,75-7,5 mg/kg per os prior to transfer to

the theatre and 20 mL of sodium citrate before induction. Instrumentation included central venous line and arterial cannula. Anaesthesia was induced / maintained with propofol (1-2 mg*kg-1/ 6 mg*kg-1*h-1) and sufentanil (0,01 mg / 0,5 µg*kg-1*h-1). In the GA-group, intubation of the trachea was facilitated with atracurium, 0,5 mg*kg-1. In the LA-group, patients received an initial dose of 0,01 mg sufentanil, I.V.; the nasopharyngeal passage was prepared with a nasal decongestant (oxymetazoline 0,01%) and local anaesthetic gel (lidocaine 2%). Following endoscopic visualization of the larynx, lidocaine 2% was sprayed on the vocal chords through the biopsy channel 2 ml each on the upper and lower aspects, allowing 2 minutes to take effect. Data collected for analysis included heart rate (HR), arterial blood pressure (SAP / DAP) and saturation (sO₂); arterial blood samples were analysed for pH, pO₂ and pCO₂. Data were documented at five time intervals: t₁ = after instrumentation, t₂ = during denitrogenation, t₃ = after sufentanil, t₄ = during direct or indirect laryngoscopy, t₅ = after completion of tracheal intubation. Statistical analysis relied upon t-tests and Wilcoxon-tests; significance was assumed at p<0,05.

Results: Demographic data revealed no differences among groups; tracheal intubations were carried out without complications. In the LA-group, HR (80 -> 73), SAP (155 -> 136), DAP (73 -> 69), sO₂ (99 -> 98), pO₂ (185 -> 147) and pH (7,42 -> 7,39) decreased from t₄ to t₅; pCO₂ (36,2 -> 41,8) increased from t₄ to t₅ (p<0,05). In the GA-group results for sO₂, pO₂, pH and pCO₂ were similar; haemodynamic variables (HR, SAP and DAP) were found increased at t₅ (p<0,05).

Conclusion: Awake fiberoptic

nasotracheal intubation does not cause clinically significant perturbations of physiological variables; in particular, it does not result in hypercapnia or hypoxia. We conclude that awake fiberendoscopic nasotracheal intubation under local anaesthesia is a safe means of primary airway management, in particular when direct laryngoscopy shall be avoided.

References: [1] McCabe JB, Nolan DJ (1986) Comparison of the effectiveness of different cervical immobilization collars. *Ann Emerg Med* 15:50-53 [2] Wangemann BU, Jantzen J-P (1993) Fiber-optically guided endotracheal intubation in neurosurgical patients. *Neurochirurgia* 36:117-122.

TELEMETRIC MONITORING OF ICP PROFILE BEFORE AND AFTER HYDROCEPHALUS THERAPY

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Background: Neurosurgical treatment in hydrocephalus therapy generally tends on normalization of intracranial pressure (ICP). As pretherapeutic intracranial conditions are often known due to appropriate diagnostics, changes in ICP after therapy usually remain unidentified. Therefore, the implantation of a telemetric intraparenchymal measurement device offers the unique opportunity to analyze the influence of different neurosurgical procedures on ICP profile.

Methods: Telemetric ICP measurement devices were implanted into the frontal brain parenchyma of 21 patients who

suffered from chronic hydrocephalus. Definitive surgical treatment consisted of first-time shunt implantation (n=6), endoscopic third ventriculostomy (n=7) and gravitational valve augmentation of an overdraining shunt system (n=8). Each patient was pre- and postoperatively measured; gathered ICP data were analyzed (mean, minimal and maximal values) and finally compared to reveal therapy-related changes.

Results: First-time shunt implantation could be proven to be an effective method both to immediately reduce mean ICP and to intercept ICP peaks. Gravitational valve insertion could successfully counteract CSF overdrainage by increasing minimal and mean ICP values. Interestingly, measurements within the first postoperative days after endoscopic third ventriculostomy revealed ICP increases in most cases.

Conclusion: Telemetric technique allows – for the first time – to exactly demonstrate influences of different neurosurgical measures on ICP in hydrocephalus therapy.

INDICATIONS OF COMPUTED TOMOGRAPHY IN CRANIOCEREBRAL TRAUMATIC LESIONS

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Background: The appearance of modern medical imaging technologies has shaped completely the diagnosis in neurosurgical pathology. The main investigative methods in use today are Computed Tomography with its derivatives (native, with contrast

substance, bone window, 3D reconstructive CT, Angio-CT) and Magnetic Resonance Imaging (MRI), native, with contrast substance and angio-MRI.

Materials and methods: For the traumatic craniocerebral pathology, the emergency investigative method which grants a maximum of efficiency at patient admission is the native CT-scan. If skull fractures are suspected the next option is 3D reconstructive CT-scan and if the lesions are more severe and intracerebral traumas are suspected another scanning option presents itself through CT-scanning with contrast substance. Any county hospital should have the logistics to provide its patients a CT-scan at admission for diagnostic and forensic reasons.

To determine the extent of the lesions it is important that the CT-scan should be repeated at 6, 12 or 24 hours after admission. Any patient with a head trauma must have a discharge CT-scan for control. The results of the CT-scan must be correlated with the patient's Glasgow score, conscience status and eventual existing injuries.

In children, the abusive usage of CT-scans can lead to modifications of the eye lens. In these conditions a repeated clinical examination and a follow-up of all diagnostic elements might avoid a repeated CT-scan.

Last but not least, the Marshall scale must also be taken into account as it distinguishes focal and diffuse intracranial lesions while correlating them to the patient's status. The second greatest indication of Computed Tomography is subarachnoid hemorrhage which raises the suspicion of a burst vascular aneurismal malformation and imposes the necessity of several other investigations to confirm the

diagnosis.

In the intracranial tumoral pathology computed tomography has only an orientative part. The elective investigation is magnetic resonance imaging. This allows for a definitive diagnosis and therapeutical attitude. In such a situation computed tomography is used only for post-op follow up of hemorrhage in the tumoral bed, ischemia or edema.

Conclusions: We consider that computed tomography has clear indications in the traumatic pathology, but this method must not be used abusively in non-traumatic lesions.

Keywords: Computed tomography (CT-scan), Magnetic resonance imaging (MRI), 3D reconstruction CT, head trauma, craniocerebral injury.

PROGNOSTIC FACTORS IN TRAUMATIC DIFFUSE AXONAL INJURIES

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Background: Traumatic brain injury (TBI) is a common cause of morbidity and mortality emphasized by the fact that it affects all age groups. Diffuse axonal injuries (DAI) associated with TBI are a great challenge to physicians due to the difficulty of early diagnosis and effective treatment. No efficient criteria for prognosis of the disease have been developed so far, due to the lack of efficient imaging and other diagnostic techniques. The purpose of this study is to evaluate prognostic criteria for mortality, functional and neurocognitive outcome.

Material and method: A systematic review of literature was performed, using the PubMed, MBase, The Cochrane Library, Willey Online Library, Scopus, Science Direct medical databases between January 1990 and July 2011. 11.398 articles were found using the keywords “diffuse axonal lesions/injury”, “traumatic brain injury”, “treatment of traumatic brain injury”, “treatment of diffuse axonal injury”, “prognosis of TBI/DAI”, “outcome after TBI/ DAI”, “neurocognitive impairment after TBI/DAI”, “patient perspective after TBI/DAI”. The analyzed articles were indexed according EFNS criteria. Article abstracts reporting original research and reviews were consulted. 77 articles were finally selected for inclusion.

Results: DAI is a predisposing factor for memory, executive and behavioral dysfunction. A reduced score on GCS scale, older age, pupillary reflex abnormalities and corpus callosum lesions are associated with a poor outcome. Younger age is associated with dysautonomia, being correlated with a poorer outcome. MRI is more accurate than CT for diagnosis and prognosis of DAI. DWI and DTI have prognostic value in evaluating functional outcome, with DTI being an efficient biomarker for microstructural changes and neurocognitive impairment. No efficient biomarkers for DAI were highlighted until now.

Conclusions: Clinical case history and advanced imaging techniques can improve our ability to diagnose DAI and have the potential to become valuable instruments in establishing prognosis for this condition.

Keywords: Traumatic brain injury, diffuse axonal injury, neurological deficit, dysautonomia, neurocognitive outcome.

UPDATE IN DECOMPRESSIVE

CRANIECTOMY IN TBI INCLUDING OWN EXPERIENCES

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The role of decompressive craniectomy (DC) in previous treatment protocols of TBI was limited because of an invasive character of the procedure. However the often poor prognosis in TBI treatment justifies nevertheless more and more wilder acceptance of the DC treatment. The DC has to be performed early enough and big enough. According to own studies depending on craniectomy diameter the patients can gain ca 100 ml of an extra space. Especially promising results can be achieved when patients are blow 50 y.o. In my opinion the sufficient DC plays an important role in the treatment of TBI.

EFFECTS OF DECOMPRESSIVE SURGERY IN PATIENTS WITH SEVERE TRAUMATIC BRAIN INJURY AND BILATERAL NON REACTIVE DILATED PUPILS

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Background: We investigated Glasgow Coma Scale (GCS) scores, intracranial pressure (ICP), cerebral perfusion pressure (CPP) changes and long-term clinical outcomes in patients with severe traumatic brain injury (STBI) associated with bilateral non-reactive dilated pupils (BNDP) who underwent decompressive surgery (DS).

Methods: The study group consisted of 28 patients with BNDP from among 147 patients underwent DS due to STBI in our department.

Results: The mean GCS score was 4.96 ± 1.20 at admission and 4.0 ± 0.00 at preoperatively. Mean ICP in non surviving patients after DS was higher ($p < 0.05$). ICP decreases after DS, in surviving patients were also higher than in non surviving patients ($p < 0.05$). The overall mortality rate was 61.02 %. The higher score of than 2 of motor score of GCS at admission was associated with lower mortality ($p < 0.05$). Four of surviving patients (14.28 %) had a functional outcome (Glasgow outcome score: 4 and 5) at one year after hospital discharge.

Conclusion: Outcome in patients with BNDP after STBI may not be always fatal or poor. Rapid DS may have increased the chance of functional survival especially in patients with admission GCS score of 6, 7.

DECOMPRESSIVE CRANIECTOMY IN THE TREATMENT OF SEVERE TRAUMATIC BRAIN INJURY: OPTIONAL OR RECOMMENDED

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Severe traumatic brain injury with refractory intracranial hypertension is a multifactorial lifethreatening disease, especially in the polytraumatized patients. Nowadays decompressive craniectomy became a very important part in the treatment of STBI. On the basis of evidence based medicine's rules many prospective, randomized trials were created to find the exact indication and timing of

the decompressive craniectomy, but the results are controversial like in the DECRA study. In our opinion considering the principles of bioethics good clinical experiences with decompressive craniectomy are enough to recommend this procedure in the treatment of STBI.

Method and results: In the past 10 years we published more articles about new technical innovations which can prove the outcome after decompressive craniectomy. These processes are used in many neurotrauma centers, but in the guidelines of STBI we couldn't reach the adequate part of this procedure.

Conclusion: It is questionable, that we could agree on the rule of decompressive craniectomy in the treatment of STBI patients, but we hope, that the good results and outcomes will help in this field.

EFFECTS OF SELECTIVE BRAIN HYPOTHERMIA AND DECOMPRESSIVE CRANIECTOMY ON NEUROLOGICAL AND RADIOLOGICAL SEQUELAE OF CLOSED HEAD INJURY IN MICE

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Objective: Both hypothermia and decompressive craniectomy have been proposed as treatment of severe traumatic brain injury. The goal of our experiment was to determine whether the selective brain hypothermia could impact the effect of craniectomy after brain trauma.

Methods: Male CD-1 mice were randomly assigned into the following groups (n=8 each): sham, decompressive craniectomy(DC), closed head injury(CHI), CHI followed by craniectomy(CHI+DC) and CHI and DC followed by focal hypothermia(CHI+DC+H). At 24h posttrauma animals were subjected to Neurological Severity Score (NSS) test and Beam Balance Score (BBS) test. The neurological outcome was specified as impairment score for NSS (0-10 points) and BBS (0-5 points). In 5 animals of each group (n=5) MR imaging using a 9.4 Tesla MRI scanner was performed. A volumetric evaluation of apparent diffusion coefficient (ADC) calculated from diffusion weighted imaging (DWI) sequence and rapid acquisition with refocused echoes (RARE) images was used to assess edema and contusion, respectively. One-way ANOVA was used for statistical analysis.

Results: The animals subjected to both trauma and craniectomy performed significantly worse(CHI+DC:6.84±2.1,p<0.001) than animals with craniectomy alone(DC:2.71±1.51). This deleterious effect disappeared if additional hypothermia was applied (CHI+DC+ H:4.41±1.8,ns). BBS was significantly worse in CHI group(2.33±1.35,p<0.05) and in CHI+DC group (2.63±1.53,p<0.05) but not in CHI+DC+H group(1.5±1.41,ns) when compared to the sham group(0.67±0.47).

Both edema and contusion volume was significantly increased in trauma and craniectomy group (CHI+DC: edema:54.4mm³±23.4,p<0.05; contusion: 61.5mm³±21.7, p<0.01) but again not in hypothermia group (CHI+DC+

H:edema:33.9mm³±14.7,ns; contusion: 34.1mm³±14.2,ns) compared to craniectomy alone (DC:edema: 17mm³±12.8; contusion:17.1mm³±13.9).

Conclusions: There was synergistic deleterious effect of mechanical and surgical trauma.

Selective brain cooling applied after trauma and craniectomy effaced the negative effect of additional surgical trauma on neurological function and radiological sequelae of brain injury. Therefore the local hypothermia may be a very promising alternative to complication-burdened systemic hypothermia. The potential of this treatment option should be explored in clinical feasibility study.

EARLY DC TO AVOID THE SUDDEN INCREASE OF ICP IN CHILDREN AFTER BRAIN INJURY

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The purpose of the retrospective study of 8 consecutive patients is to call our attention to the optimal timing of the decompressive craniectomy (DC) in children.

Method: We report the outcomes of 8 children under the age of 12 with severe head injuries. DC was performed at different intracranial pressure (ICP) (20 and 25 mmHg) levels.

Results: Our results suggest that above 20 mmHg, very fast progression of ICP (within 15min.) can be occurred, which may limit the time available to plan and perform DC with a successful patient outcome.

Conclusion: Considering the anamnestic data it could be useful to perform DC at 20-22 mmHg ICP in young patients in

order to prevent the potential of very fast brain swelling if there is no possibility to perform durotomy within 20min after the onset of raising the ICP. It is especially considerable in poor countries where the emergency route could be less organized because of locations of building and extreme load of the staff. Prospective randomized trials are not necessary to evaluate the indication and standardization in lifethreatening illness as the rule of bioethics states. Scientific rationale enough to accept a consideration.

IN VITRO AND IN VIVO EVIDENCE TO CLARIFY THE EFFECTIVENESS OF THE VASCULAR TUNNEL TECHNIQUE IN THE COURSE OF DC

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Introduction: To prove the evidence of the stability of vascular tunnels which protect the bridging veins during decompressive craniectomy (DC).

Method: The observation was carried out in vitro (cadaver) and in vivo (surgery and MRI) in order to verify the durability of the vascular tunnel.

Results: In vivo observation proved the durability of vascular tunnel even 2 months later.

Conclusion: It has been concluded that vascular tunnel guarantees the efficacy of DC even at a high level of ICP. On the other hand surgical intervention could be dangerous without a vascular tunnel even at an acceptable level of ICP, because of possible occlusion of bridging veins. Prospective randomized trials are not necessary to evaluate the indication and

standardization in life threatening illness as the rule of bioethics states. Scientific rationale enough to accept a consideration.

CRANIOTOMY OR DECOMPRESSIVE CRANIECTOMY FOR EVACUATION OF ACUTE SUBDURAL HAEMATOMAS: PROPOSAL FOR A MULTICENTRE RANDOMISED TRIAL

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Background: Acute subdural haematomas (ASDH) in addition to exerting mass effect are often associated with underlying parenchymal injury and significant brain swelling. In some patients evacuation of the ASDH via a craniotomy with bone flap replacement may not adequately control raised ICP despite post-operative management in ICU. The BTF guidelines

published in 2005 identified the role of decompressive craniectomy (DC) versus craniotomy as the top key issue for future investigation likely to improve the care of patients with ASDH.

Design: We propose a multicentre randomised parallel group trial comparing DC with craniotomy for evacuation of ASDH.

Subjects: Eligible patients will be identified taking into account the following inclusion and exclusion criteria.

Inclusion criteria: Clear history of trauma, initial GCS ≤ 13 , ASDH evident on CT scan, the admitting neurosurgeon feels that the haematoma needs to be evacuated, lower age cut-off 5 or 10 years, upper age cut-off 65 or 75 years.

Exclusion criteria: Intra-operative brain swelling such that the bone flap cannot be replaced, patient is obeying commands immediately pre-operatively, bilateral fixed and dilated pupils, devastating extra-cranial injuries with survival >24 hours being unlikely, brainstem injuries on CT.

Outcome measures: The primary outcome measure will be the eGOS at 6 months after injury. Secondary endpoints include: eGOS at 1 and 2 years after injury, quality of life (SF-36 at 1 and 2 years after injury), GCS on discharge from ICU and from hospital, length of stay in ICU and neurosurgical unit, major adverse events, health economic analysis, early return to operating theatre, incidence of hydrocephalus.

Sample size: Retrospective studies have shown a favourable outcome in about 35% of patients undergoing evacuation of ASDH. Based on IMPACT recommendations, statistical analysis will use an ordinal approach, based on proportional odds methodology. The estimated sample size is 800 patients (400 in

each arm) to detect a 7% absolute difference in favourable outcome [power 80% and significance 5% (35% vs 42%)].

Conclusions: If such a trial is also accompanied by prospective data collection for nonrandomised, eligible patients, then it is likely that clinicians in the future will be better guided when making decisions regarding the management of patients with ASDH.

TRAUMATIC BRAIN INJURY: MEDICO-LEGAL EXPERTISE IN FRANCE

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Objective: To report the French current practice of medico-legal expertise for persons with traumatic brain injury (TBI).

Methods: Up to date analysis of the expert appraisal dedicated to TBI persons, in the light of recent rules and improvements to do with the procedure, the examination, the ways of assessment and of compensation.

Results:

1. Procedure: the specificities of the handicap require a specialized expert, a specific mission, a stage by stage expertise. There are 2 expertise types: "amicable" and judicial: both need to be contradictory.

2. Examination: it requests the family witness, a thorough neuropsychological examination, taking into account the behavior, the assessment of autonomy, participation and quality of life and a MRI.

3. Evaluation and compensation need specific tools and argumentation. The most important domains to evaluate are the pre-traumatic state, the functional deficit, the

help needed, the vocational consequences and the limitation to build a couple and to raise children.

Conclusion: The TBI long-term and often hidden handicap needs specific means to perform an assessment adapted to mild and severe TBI as well.

TRAUMATIC BRAIN INJURY: THE ROLE OF MEDIATION IN COMMUNITY INTEGRATION

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Objective: To report the role of mediation in traumatic brain injury (TBI) re-entry.

Methods: Mediation is a non-violent answer in conflict-solving between brain injured people, families and professionals. Therefore it could avoid a lawsuit, a destabilisation of the person in the rehabilitation process. How such an approach could apply to TBI?

Results:

1. The success factors: each protagonist's will to solve their conflict in a peaceful way; the time dedicated to conflict-solving.

2. The very process of mediation: be able to express their pains and their needs... before starting off a dialogue or seeking an agreement; watch when a « swing » towards a harmonization of views is on the way to let both sides develop a solution.

3. The mediator himself: licensed in mediation; skilled in the subject matter; not an arbitrator, help both parties to meet half-way; «be confused», remain open, without being prejudiced.

4. Deal with TBI specificities: an inferior position due to mental disorders, in relation to interlocutors with full capacities; this

asymmetry can be compensated by family, lawyer and by previous one-to-one; reformulate, identify fatigue and tension, more short interviews rather than long ones. An example is presented.

Conclusion: « An existence which, on a human scale, seemed to be heading towards a blind alley, actually became a passage » (K. Wojtyła, 1998).

RETURNING HOME FOLLOWING SEVERE CEREBAL INJURY AND DISEASE

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Besides vital threat severe damage to the brain causes loss of communication, cognitive functions, control of body functions and mobility. Early neurological rehabilitation is reserved to patients with the most severe injury impact and is characterized by the combination of acute medical care and rehabilitative procedures. Returning home of survivors from severe cerebral injury and disease gives an overall measurement of the quality of medical and rehabilitational performance.

The Neurological Clinic in Wangen provides 20 hospital beds for early rehabilitation. Over a period of 10 years 1133 patients have been treated. About one third was suffering from severe traumatic brain injury, another third ischemic or hemorrhagic brain infarction, 15 % subarachnoid hemorrhage, 10 % cerebral hypoxia, 8 % other etiologies (encephalitis, surgical interventions for cerebral abscess or neoplasm). Usually, returning home requires relevant improvement in cognition, communication, mobility and

self care. Our rehabilitation concepts preferentially cover these domains. In addition in appropriate cases the relatives were instructed how to manage remaining problems.

The in-hospital mortality was 3 %. 15 % of our patients had to be transferred to another hospital, partly due to life-threatening complications, partly due to intended treatment of concomitant medical problems as fractures. 10 % did not achieve a state of at least partial independency in daily life and went to a special-care home. 10 % remained completely dependant as well but were cared for by their relatives at home. Early rehabilitation is followed by an intermediate rehabilitation in patients who exhibit a favourable course. These persons, 42 % of 1133 in our collective, showed partial or complete independency at the end of the in-hospital rehabilitation and could live at home without any (about one half) or with little assistance. This result justifies intensive efforts.

THE PSYCHOTHERAPY'S IMPORTANCE IN NEURORECOVERY OF NEUROSURGICAL PATIENTS

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The existence of reciprocal psyche-soma influence requires a double relationship, medical and psychological; the consequences of poor communication include noncompliance to treatment and malpractice legal actions. This paper provides explanations which necessarily

require psychosomatic approach of each patient, the patient reacting massively in psychological plan. Various studies revealed the fact that psychological intervention enhances not only the patient's comfort but also his/her life quality itself and that it can help him leave longer. The results of these studies clearly indicate the fact that psychotherapy has positive effects on emotional adaptability, functional adaptability and on symptoms related to the illness and treatment in the case of patients with neurosurgical pathologies. Delimitation of competence of various specialties is only for the benefit of the patient, who will be investigated and treated according to custom issues ("There are no diseases, only ill people"), imposing thus the integration of the psychologist in the therapeutic team.

Keywords: neurosurgical, psychotherapy, patient, quality of life, team, multidisciplinary.

DECOMPRESSIVE CRANIECTOMY IN THE TREATMENT OF SEVERE TRAUMATIC BRAIN INJURY: OPTIONAL OR RECOMMENDED

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In the field of neurorehabilitation there is an increasing awareness about the importance of translation from basic scientific findings into practical application while most of the therapeutic interventions have encountered barriers during exploration of evidencebased effectiveness. Appropriate research programs are thus essential to develop highquality research methods supporting specific treatment models in NRB practice. Evidence Based

Medicine model has been adopted in NRB clinical research to face many methodological challenges affecting the bench-to-bedside process. No longer based on subjectivity EBM model has shown to enhance appropriateness of rehabilitation actions in several neurological settings, such as Multiple Sclerosis, Parkinson's disease, children with Cerebral Palsy and Stroke through a critical use of the best scientific evidences. Nonetheless a dissonance when trying to apply research findings to the clinical encounter still exists because of the complexity of socio-cultural setting where physician and patient co-operate. A tempt to provide a way for examining these individual and contextual factors is represented by Narrative Based Medicine, a model based on patients' story of illness which restores the role of emotional experience within the relational context of care.

Starting from EBM and NBM a new integrated and bio-psycho-social oriented model could meaningfully fill the gap between research and clinical practice in NRB both theoretically and practically.

Evidence based medicine: what it is and what it isn't. 1996. Sackett DL, Rosenberg WM, Gray JA, Haynes RB, Richardson WS. Clin Orthop Relat Res. 2007 Feb;455:3-5. Narrative evidence based medicine. Charon R, Wyer P; NEBM Working Group. Lancet. 2008 Jan 26;371(9609):296-7.

WHAT QUALITY OF LIFE AFTER TRAUMATIC BRAIN INJURY? A NOVEL INSTRUMENT, QOLIBRI

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Objective: To report the clinical use of the QOLIBRI, a disease-specific measure of health-related quality-of-life after traumatic brain injury (TBI).

Methods: The QOLIBRI, with 37 items in six scales (cognition, self, daily life and autonomy, social relationships, emotions and physical problems) was completed in seven languages (Finnish, German, Italian, French, English, Dutch, Portuguese). QOLIBRI scores were examined by variables likely to be influenced by rehabilitation interventions and included socio-demographic, functional outcome (GOSE), health status (SF-36) and mental health variables (HADS).

Results: The QOLIBRI was self-completed except for severe TBI who completed it in interview. It was sensitive to areas of life amenable to intervention, such as accommodation, work participation, health status (including mental health) and functional outcome.

Conclusion: The QOLIBRI provides information about patient's subjective perception of his/her HRQoL which supplements clinical measures and measures of functional outcome. It can be applied across different populations and cultures. It allows the identification of personal needs, the prioritization of therapeutic goals and the evaluation of individual progress. It may also be useful in clinical trials and in longitudinal studies of TBI recovery.

PHARMACOLOGICAL AND NON-PHARMACOLOGICAL STRATEGIES IN BRAIN PROTECTION AND RECOVERY

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The old concept that neuroprotection means suppressing pathophysiological processes, the idea that a single mechanism molecule might be effective in clinical practice are obsolete today, and represents the root cause of failure.

The effects of etiological agents on the brain traditionally are conceived as a linear sum of independent pathophysiological processes (excitotoxicity, inflammation, apoptosislike, oxidative stress, etc) generating the pathways of pathological cascades (ischemic, traumatic, neurodegenerative).

The pathway approach has produced a very detailed understanding of molecular changes in the postlesional brain but it possesses blind spots that are critically related to the failure of neuroprotection.

This has influenced the simplistic way of understanding the concepts and as well, all attempts at clinical neuroprotection. The idea that a system is a linear sum of its component parts is called "superposition", and the associated approach is called "reductionism".

The failure of clinical neuroprotection, recovery and modifying disease therapies in many chronic conditions, is measuring the failure of the reductionistic approach to the problem.

The pathways can and do interact in a variety of fashions, via cross-talk, positive and negative feedback, etc, but the pathway heuristic itself offers no formal means of understanding such interactions.

The expectation of discovering the magic cell death pathway X has affected

experimental designs of neuroprotection studies. The causality demonstrated by the application of the plus/minus strategy is ultimately an illusion. To overcome the limits of the pathway view of cell function, a different approach is needed.

Such an approach is provided by network concepts applied to complex systems.

The bistable model based on these assumptions seems to be a better instrument for a successful translational approach in brain lesion and recovery.

UNRESPONSIVE WAKEFULNESS SYNDROME (UWS) WHY WE NEED A NEW NAME FOR THE APALIC SYNDROME OR VEGETATIVE STATE

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Objective: Some patients awaken from coma but remain unresponsive without response to command. This syndrome is known as apallic syndrome, coma vigile, and vegetative state.

Based on the results of modern neuro-electrophysiological investigations and functional brain imaging we here would like to introduced in the German speaking countries a new name for this syndrome of severest brain functional disturbances which we called in English unresponsive wakefulness syndrom (abbreviated UWS) in 2010

(see <http://www.biomedcentral.com/1741->

7015/8/68; www.aerzteblatt.de/grundsaeetze)

Patients and Method: In Europe, this clinical syndrome was initially termed apallic syndrome by 1940 Kretschmer (1949), coma vigil by Calvet and Coll (1959), but it is currently known in the medical community and media as persistent vegetative state (PVS), Jennet and Plum (1972). It's characterized by the clinical feature when patients awaken from coma but remain unresponsive without response to command.

Results: The prevalence of VS/AS in hospital settings in Europe is 0.5–2/100.000 population / year; one-third following acute traumatic brain damage. Functional neuroimaging and cognitive evoked potential studies demonstrated that physicians should be cautious to make strong claims about awareness in some patients without behavioral responses to command. Given these concerns regarding the negative associations intrinsic to the term vegetative state/apallic syndrome as well as the diagnostic errors the European Task Force on Disorders of Consciousness claim for a new term.

Discussion: Many clinicians feel uncomfortable when referring to patients as vegetative. Indeed, to most of the lay public and media vegetative state has a pejorative connotation and seems inappropriately to refer to these patients as being "vegetable-like". Politicians and religious groups have hence felt the need to emphasize these vulnerable patients' rights as human beings.

Conclusion: To offer physicians the possibility to refer to the diagnose of an unresponsive wakefulness syndrome equivalent to full stage AS/VS, abbreviation UWS. Since this neutral descriptive term indicates patients showing a number of clinical signs (hence syndrome) of

unresponsiveness in the presence of wakefulness. This new term respects the dignity and rights of the patient and the beloved.

ROBOT-ASSISTED ASSESSMENT OF THE ARM IN NEUROREHABILITATION

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One major limitation in neurorehabilitation is the lack of repeatable and objective assessment of performance and progress of the patient. We developed a robot-assisted assessment tool for objective and quantitative assessment of the arm in patients with neurological deficits, e.g. after spinal cord injury (SCI). The robot-assisted assessment tool is integrated in the arm therapy robot ARMin which has been developed by the groups of R. Riener, V. Dietz and A. Curt at ETH Zurich and University Hospital Balgrist (University of Zurich). ARMin is an exoskeletal robot with seven degrees of freedom. The assessment tool consists of software and a visual display and includes tests for passive and active range of motion (A-ROM), workspace and speed of movement (AMOVE), maximum voluntary force (A-FORCE), distance to path ratio and deviation from target (A-GOAL), and stiffness (A-STIFF).

We present the results of robot-assisted assessments in four patients after SCI and the correlation with clinical tests (range of motion with goniometer, Ashworth Scale, Tardieu Scale, Van Lieshout test, GRASSP,

SCIM, MMT of the upper limb). The results of the study are promising. The assessments correlate with clinical scores; they reflect an improvement of function over time and detect even small changes in the quality of movements which cannot be measured in clinical testing.

SHOULD LOBAR INTRACEREBRAL HAEMATOMAS DUE TO CEREBRAL AMYLOID ANGIOPATHY BE EXCLUDED FROM THE STICH II TRIAL: A NEUROPATHOLOGICAL STUDY?

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Background: STICH II is a multicentre randomized trial comparing early craniotomy to evacuate the lobar haematoma with an initial conservative treatment. Lobar haematomas in elderly patients are frequently due to cerebral amyloid angiopathy (CAA). CAA is a generalized cerebrovascular disease with bad outcome and frequently associated to Alzheimer dementia (AD).

Purpose: The present post-mortem study aims to compare the incidence of cerebrovascular lesions in elderly demented patients, with and without CAA, and in age-matched controls.

Patients and Methods: Thirty brains of AD patients with CAA were compared to thirty AD brains without CAA, twenty brains with Lewy body dementia (LBD) and fifteen controls. Prevalence and severity of ischaemic as well as of haemorrhagic lesions were compared.

Results: Sixteen out of the thirty brains with CAA had an intracerebral haemorrhage with a total number of twenty haematomas: eighteen had a lobar, one a

thalamic and one a cerebellar location. Multiple haematomas of different age were observed in three brains. Lobar haematomas, white matter changes, cortical microbleeds and subarachnoid haemorrhages prevailed and were more severe in the CAA group compared to the AD without CAA, LBD and control groups.

Conclusions: On gross brain examination one should suspect CAA in elderly patients with mainly recurrent lobar and subarachnoid haemorrhages, severe white matter changes and microbleeds. The in vivo suspicion of CAA can only be made by using FLAIR, T2 and T2* MRI sequences. Inclusion of patients with lobar intracerebral haematomas due to CAA could weaken the results of the STICH II trial.

TRAUMATIC ICH: CHARACTERISTICS OF PATIENTS IN THE ONGOING STITCH(TRAUMA) TRIAL

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Introduction/objective: STITCH (Trauma) is the first international randomised controlled trial of early surgery versus initial conservative treatment for patients with traumatic ICH (TICH). Although there have been previous trials for patients with spontaneous ICH (SICH), we cannot assume that the pathogenesis of TICH and SICH are the same and that the patients affected by these conditions will respond identically to current treatments. Here we describe the characteristics of STITCH(Trauma) patients and compare them to lobar SICH patients in STICH II.

Methods: Adult head injury patients are

eligible for STITCH(Trauma) if they:

Have CT evidence of 1 or 2 TICHs/contusions: each with a volume > 10ml.

Are within 48 hours of head injury.

Demonstrate clinical equipoise in the opinion of their neurosurgeon.

Patients randomised to early surgery undergo surgery as soon as possible. The appropriate surgical technique is at the discretion of the treating surgeon. Outcome is measured by postal questionnaire.

Results: On 31 Dec 2011, 120 patients were recruited into STITCH(Trauma) and 521 into STICH II. STITCH(Trauma) patients had a median age of 51 years, randomisation GCS of 12 and primary haematoma volume of 23 ml. STICH II patients had a median age of 65 years, randomisation GCS of 13 and haematoma volume of 36ml.

Conclusion: STITCH(Trauma) patients do differ: they are younger and have smaller primary haematomas than STICH II patients. Whilst STICH II will finish this year, recruitment into STITCH(Trauma) will continue so that we can precisely define the indications for surgical intervention for TICH in future.

SHOULD WE MEASURE OUTCOME AT 12 MONTHS AS WELL AS 6 MONTHS FOR ACUTE BRAIN INJURY TRIALS: EVIDENCE FROM [STITCH(TRAUMA)]?

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Introduction: The ongoing STITCH (Trauma) study aims to determine whether a policy of early surgery in patients with traumatic ICH improves outcome compared to a policy of initial conservative treatment. In study design, identification of the most appropriate outcome measure is vital. The six-month time point is commonly used but would 12 months provide better information on recovery from the intervention?

Methods: This international randomised controlled trial had recruited 128 patients by the end of January 2012. This analysis examines the relationship between outcome at 6 and 12 months and between baseline variables and outcome.

Results: Of the 40 patients who had reached 12 month follow-up, outcome was available for 38: 10 had died (all before 6 months), 14 were good recovery, 8 moderate disability and 6 severe disability. Of the surviving patients 61% had maintained the same level as at 6 months, 29% improved and 11% deteriorated. Examination of the Rankin in survivors shows a similar picture with the majority of patients being grade 0 or 1. Outcome at 12 months was significantly related to admission GCS ($p=0.001$) and patient's age ($p=0.038$). At six months outcome for the same patients was significantly related to admission GCS ($p=0.015$) and time to randomisation ($p=0.044$).

Conclusions: This analysis, although conducted on a small number of patients, suggests that for an acute intervention primary outcome measurement should be conducted at 6 months. Although patients do go onto improve beyond this point they are also likely to suffer from other problems that affect their outcome.