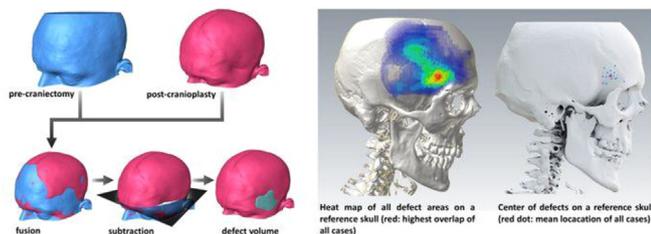


16 had a hollowing defect. Their average defect volume was $5.0 \text{ cm}^3 \pm 4.5 \text{ cm}^3$. The localizations were in the area behind the zygomatic process and below the superior temporal line (mean area $3 \times 3 \text{ cm}^2$). Surgical attempts of temporal muscle restoration were more often found in reports of good results ($p < 0.01$), but also in 50% of reports, whose surgeries resulted in a defect. Mean time between the two surgeries was 112 ± 43 days. There were no significant differences regarding time between the two surgeries, age or performing surgeon.

Conclusion: This work supplies evidence for the indication of a surgical corrective during cranioplasty in a cosmetically relevant area. Based on our analysis, future focused surgical strategies may obtain better aesthetical results.



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MORTALITY OF SURGICALLY TREATED NEUROTRAUMA IN ELDERLY PATIENTS AND THE DEVELOPMENT OF A PREDICTION SCORE

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Background: As the population worldwide is aging, the need for surgery in elderly patients suffering from neurotrauma is growing. The aim of this study was to compare the outcome of elderly patients undergoing surgery for neurotrauma with younger patients and to identify risk factors for mortality.

Methods: We retrospectively analyzed consecutive patients undergoing craniotomy or craniectomy for neurotrauma at our institution from 2012-2019. Patients were divided into two groups (≥ 70 years or < 70 years) and compared. Primary outcome was 30-day mortality rate, secondary outcomes were clinical outcome and complications. Potential risk factors for 30-day mortality were assessed in a uni- and multivariate regression model for both age groups, forming the basis of a 30-day mortality prediction score.

Results: We included 163 consecutive patients with an average age of 57.98 (± 19.87) years and 54 patients ≥ 70 years. Old patients showed a significantly better median preoperative GCS compared to young patients ($p < 0.001$), and fewer pupil abnormalities ($p = 0.001$), despite, having a higher Marshall Score ($p = 0.07$) at admission. Mortality rate was slightly higher in old patients (18.5% vs. 16.5%), while for patients suffering from aSDH younger patients had a higher mortality rate (24% vs. 28%) without statistically significant difference between the groups ($p = 0.921$ and $p = 0.098$). Multivariate regression analysis identified low pre- and postoperative GCS and the lack of postoperative prophylactic low molecular weight heparin (LMWH) treatment as risk factors for 30-day mortality. Our score showed a high accuracy of predicting 30-day mortality with an AUC of 0.88.

Conclusion: Elderly patients after neurotrauma present with a better GCS at admission despite having more severe radiographic injuries. Mortality and favorable outcome rates are comparable between the age groups. Age was not found to be a risk factor for higher mortality, justifying surgical treatment for neurotrauma in selected elderly patients.

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HEAD TRAUMA IN LOW AND MIDDLE INCOME COUNTRY: ORGANIZATION OF NEUROTRAUMA CARE AND ROLE OF REGIONAL CENTERS

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Traumatic injuries causing more than 5 million deaths each year. More than 90% of injury deaths occur in low- and middle-income countries, where preventive

efforts are often nonexistent, and health-care systems are least prepared to meet the challenge. In Albania between 2000 and 2020, 7939 people died in car accidents. In 2018 there were 2075 road accidents. 295 people died (237 male and 58 female). 478 people were seriously wounded (of these 388 men and 90 women) and 2025 were wounded, where some of them will be disabled for the rest of their lives. It is unclear the financial losses of these injuries. Compared with the European Union in Albania accidents occur twice as much, not only in proportion to the population, but the number of vehicles in circulation. Each year, for every one million people in Albania, 119 lose their lives in car accidents, while in European Union countries only 40 to 60 citizens lose their lives in car accidents. Our clinic is in charge for the treatment of traumatic brain and spinal injuries, for all the country. The number of patients treated per year is 1200, while the number of patients consulting in emergency is around 10000 per year. This is due to the lack of specialization but also because of the emigration of doctors. In Albania, the neurosurgery service has a limited number of doctors and is only in one city. Regional hospitals do not have neurosurgical services. In these situation, the telemedicine system has been used and transport options are improved. The management of craniocerebral trauma need high economical support. The use of telemedicine in neurotrauma management is beneficial (medical and economical). Using clinical and CT monitoring is effective especially in the lack of ICP monitoring. Participation in international trials helps in treatment of TBI.

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FLOATING DECOMPRESSIVE CRANIOTOMY AS AN ALTERNATIVE TO DECOMPRESSIVE CRANIECTOMY

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Objective: Floating decompressive craniotomy (FDC) is an alternative to decompressive craniectomy (DC) in patients with less significant space-occupying process. Floating bone flap and duraplasty provide expansion potential whilst obviating the need for cranioplasty in the future. The objective of this study was to compare FDC with DC and demonstrate that FDC is an effective alternative to DC in a selected subgroup of patients.

Methods: We evaluated a prospective group of 33 FDC patients along with a retrospective control group of 33 DC patients. The representation of space-occupying pathologies was the same in both cohorts (traumatic brain injury – 25, intracerebral hemorrhage – 4, subarachnoid hemorrhage – 2, malignant infarction – 2).

Results: No significant differences were identified in baseline demographics, timing of the surgery, reoperation for persistent intracranial hypertension or postoperative intracranial pressure (ICP) between FDC and DC groups. Both methods resulted in adequate control of ICP. In the FDC group the following were detected: borderline significant higher initial motor GCS ($p = 0.06$), lower incidence of preoperative anisocoria ($p = 0.0013$), lower Rotterdam score ($p = 0.0002$), lower incidence of postoperative complications ($p = 0.0267$), shorter hospital stay ($p = 0.0248$), stay at the ICU ($p = 0.0198$) and mechanical ventilation period ($p = 0.0009$) and better six month clinical outcome ($p = 0.0025$).

Conclusions: FDC is an effective alternative to DC in a subgroup of patients with a less significant space-occupying process.

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DIAGNOSTIC SUBDURAL EEG ELECTRODES AND SUBDURAL HEMATOMA (DISEASE): A STUDY PROTOCOL FOR A PROSPECTIVE NONRANDOMIZED CONTROLLED TRIAL

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Background: Epileptic seizures are common clinical features in patients with acute subdural hematoma (aSDH); however, diagnostic feasibility and therapeutic monitoring remain limited. Surface electroencephalography (EEG) is the major diagnostic tool for the detection of seizures but it might be not sensitive

enough to detect all subclinical or nonconvulsive seizures or status epilepticus. Therefore, we have planned a clinical trial to evaluate a novel treatment modality by perioperatively implanting subdural EEG electrodes to diagnose seizures; we will then treat the seizures under therapeutic monitoring and analyze the clinical benefit.

Methods: In a prospective nonrandomized trial, we aim to include 110 patients with aSDH. Only patients undergoing surgical removal of aSDH will be included; one arm will be treated according to the guidelines of the Brain Trauma Foundation, while the other arm will additionally receive a subdural grid electrode. The study's primary outcome is the comparison of incidence of seizures and time-to-seizure between the interventional and control arms. Invasive therapeutic monitoring will guide treatment with antiseizure drugs (ASDs). The secondary outcome will be the functional outcome for both groups as assessed via the Glasgow Outcome Scale and modified Rankin Scale both at discharge and during 6 months of follow-up. The tertiary outcome will be the evaluation of chronic epilepsy within 2-4 years of follow-up.

Discussion: The implantation of a subdural EEG grid electrode in patients with aSDH is expected to be effective in diagnosing seizures in a timely manner, facilitating treatment with ASDs and monitoring of treatment success. Moreover, the occurrence of epileptiform discharges prior to the manifestation of seizure patterns could be evaluated in order to identify high-risk patients who might benefit from prophylactic treatment with ASDs.

Trial registration: ClinicalTrials.gov identifier no. NCT04211233.

5.3 Chronic Subdural Haematoma

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BURR HOLE CRANIOSTOMY VERSUS MINICRANIOTOMY IN CHRONIC SUBDURAL HEMATOMA: A COMPARATIVE COHORT STUDY

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Background: Chronic subdural hematoma (CSDH) is one of the most common neurosurgical diseases. In surgical management of CSDH there is a lack of standardized guidelines concerning surgical techniques and a lack of consensus on which technique(s) are optimal. Neurosurgical centers have shown a wide variation in surgical techniques. The purpose of this study was to compare two different surgical techniques, 1-burr hole craniostomy with an active subgaleal drain (BHC) and minicraniotomy with a passive subdural drain (MC).

Methods: We conducted a multicenter retrospective cohort study at two neurosurgical centers in Sweden which included patients with unilateral CSDHs that received surgical treatment with either BHC or MC. During the study time periods there were no major alterations in the surgical techniques and management of CSDH. The primary outcomes in comparison of the techniques were 30-day mortality, recurrence rate and complications according to the Landriel Ibañez grading system for complications.

Results: A total of 1003 patients were included in this study. The BHC subgroup included 560 patients and the MC subgroup included 443 patients. 30-day mortality when comparing BHC (2.3%) and MC (2.7%) was similar ($p=0.701$). Comparing recurrence rate for BHC (8.9%) and MC (10.8%) showed no significant difference ($p=0.336$). We found that medical complications were significantly more common in the MC group ($p=0.001$). Serious surgical complications were also associated with the MC group ($n=10$, $p=0.003$). Out of the 10 patients with serious surgical complications in the MC group, 8 had post-operative acute subdural hematomas.

Conclusion: BHC was comparable to MC concerning 30-day mortality rate and recurrence rates. Indicating that BHC which is less invasive holds at least equivalent effectiveness compared to MC. We also observed that MC was significantly associated with medical complications and serious surgical post-operative complications indicating a better safety profile when using the BHC technique.

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SURGICAL OCCLUSION OF MIDDLE MENINGEAL ARTERY IN TREATMENT OF CHRONIC SUBDURAL HEMATOMA: ANATOMICAL AND TECHNICAL CONSIDERATIONS

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Background: The aim of chronic subdural hematoma (CSDH) treatment is to relieve pressure to improve neurological symptoms and avoid recurrence. The blood supply from the middle meningeal artery (MMA) to the hematoma membranes has become a research target, to enhance our understanding of growth and re-growth of a CSDH. Endovascular embolization of the MMA (eMMA) reduces recurrence rates, but this effect must be confirmed in a randomized controlled setting. The aim of this study was to assess anatomical and technical aspects of surgical occlusion of the MMA (soMMA), as an alternative to eMMA. **Method:** Technical aspects of soMMA were assessed using cadaver head dissection. MMA anatomy was examined by mapping the branching pattern and distribution of MMA in dry skulls, and CSDH position was investigated by analysis of computed tomography (CT) of CSDHs. Finally, we evaluated the possibility of CT-guided navigation to mark the branching point of the anterior MMA division on the skin.

Results: We established anatomical landmarks to locate the MMA and found that the anterior MMA branch can be occluded through a single burr hole at the pterion. CT of 1454 CSDHs showed that the CSDH was anteriorly located in 57.5% compared with posteriorly in only 3%. This correlated with the anterior branch of the MMA being dominant in 58% of dry skull samples examined. We further confirmed that the MMA can be localized by neuronavigation as an alternative to using anatomical landmarks and average measurements.

Conclusion: A CSDH is mainly anteriorly located and supposedly primarily supplied by the anterior MMA branch. In a simulated setting, soMMA can be performed during the same procedure as hematoma decompression. A few reservations notwithstanding, we find that soMMA may be a viable alternative to eMMA in most CSDH cases and that soMMA should be further evaluated in a clinical setting.

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SURGICAL SIGNIFICANCE OF BILATERALLY FIXED AND DILATED PUPILS AND SPONTANEOUS REGRESSION IN A CASE OF NON-TRAUMATIC ACUTE SUBDURAL HAEMORRHAGE: REPORT AND LITERATURE REVIEW

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Background: Bilaterally fixed and dilated pupils (BFDP) in traumatic acute subdural haematoma (ASDH) patients is an ominous sign which suggests irreversible brainstem injury. (Stone *et al*, 1983 & Koc *et al*, 1997). Whether non-traumatic ASDH patients with BFDP follow similar outcomes is unknown. Furthermore, the recording of spontaneous ASDH regression is rare.

We present a case of a 64-year-old gentleman with a spontaneous ASDH and prolonged BFDP who was found with a GCS score of 4. Despite use of sedation and mannitol, BFDP remained for >3-hours and surgery was not recommended. At 10-hours post-admission, re-assessment revealed asymmetric but reactive pupils. Repeat CTH remarkably showed reduced SDH thickness. The patient continued improving and was eventually transferred for craniotomy and subdural evacuation. The post-operative course was complicated with infection but his functional outcome, 3-months post-operatively, was excellent with a GCS of 15.

Methods: A systematic literature search was conducted to (i) investigate the value of BFDP duration in indicating surgical viability, and (ii) the mechanisms underpinning spontaneous ASDH regression. Studies were searched across PubMed, Ovid databases using standard terms for ASDH, BFDP, and spontaneous regression.