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Surgical fixation of traumatic cervical spine fractures in South-East Norway

Mads Aarhus, Syed Ali Mujtaba Rizvi, Tor Brommeland, Eirik Helseth, Hege Linnerud, Jalal Mirzamohammadi

Frie foredrag 1, oktober 26, 2023, 09:15 - 10:30

Background: Management of cervical spine fractures (CS-Fx) is a common task for all general neurosurgical departments. Instable fractures and dislocations, neurological compression, and pain related to the fracture are main indications for surgery. When cervical spinal cord injury (cSCI) is present, much of the debate is on the timing of surgery. Further, data on the current caseload of CS-Fx facilitates planning of future treatment chains. On this background, we have investigated the occurrence and handling of CS-Fx in the Oslo University Hospital catchment area.

Methods: Population-based retrospective database study from the South-East Norway (SEN) health region with 3.1 million inhabitants. We included all consecutive cases diagnosed with a CS-Fx in 2015–2022. We extracted the following parameters: demography, injury description, cervical spinal cord injury, type of surgery, use of neuronavigation, timing of surgery.

Results: We registered 3622 consecutive cases with CS-Fx (crude incidence 15.1/100,000 person-years). The median patient age was 63 years, 67% were males, 39% had a preinjury severe systemic disease, 16% were under the influence of ethanol, and 49% had multiple trauma. Concomitant cervical spinal cord injury occurred in 11%, of which 43% had central cord syndrome (CCS) and 57% with non-CCS. The surgical fixation rate was 23%, where 35% had cervical spinal cord injury (cSCI). We applied navigation assisted screw placement in 32%. The surgical approach was anterior in 54%, posterior in 32%, and 360° in 14%. Of patients with cSCI, 43% and 65% were operated within 24h and 48h, respectively. Patients with non-CCS compared to CCS were operated earlier.

Conclusions: The real world incidence of CS-Fx in SEN was 15.1/100.000. One quarter needed surgical fixation. We applied neuronavigation in 32%. Combined anterior and posterior fixation was necessary in 14%. In 11% concomitant SCI occurred, where 43% had surgery within 24h.

Prevalence of neural tube defect at ultrasound examination among pregnant women in Addis Ababa: A community-based study

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Frie foredrag 1, oktober 26, 2023, 09:15 - 10:30

Abstract

Background

The prevalence of neural tube defects (NTDs) varies between countries and regions worldwide with numbers typically in the range 9 to 22 per 10 000 births. Some hospital-based studies have reported a higher birth prevalence of NTDs in Ethiopia including Addis Ababa, but these findings are not confirmed in studies of the general population.

Objectives

The primary aim of this study was to estimate the prevalence of NTDs at ultrasound examination in communities of Addis Ababa and to provide a description of the dysmorphology of the NTD cases.

Methods

We enrolled 958 pregnant women from 20 randomly selected health centers serving 10 sub cities in Addis Ababa during the period October 1 in 2018 to April 30 in 2019. Of these 958 women, 891 had a subsequent follow-up ultrasound examination with special focus on NTDs. We estimated the prevalence of NTDs and compared it with previously reported hospital-based birth prevalence estimates from Addis Ababa.

Results

Among 891 women, 13 had twin pregnancy. We identified 15 NTD cases among 904 fetuses, corresponding to an ultrasound-based prevalence of 166 per 10,000 (95% CI: 100-274). There were no NTD-cases among the 26 twins. Eleven had spina bifida (122 per 10,000, 95% CI: 67-219). Among the 11 fetuses with spina bifida, three had a cervical and one had a thoracolumbar defect whereas the rest were of unknown type. Seven of the 11 spina bifida defects had skin covering, while two of the cervical lesions were uncovered.

Conclusion

We report a high prevalence of NTDs among pregnancies in communities of Addis Ababa based on screening by ultrasound. The prevalence was even higher than previous hospital-based studies in Addis, and the prevalence of spina bifida was particularly high.

Quality indicators for evaluating the 30-day postoperative outcome in pediatric brain tumor surgery: A 10-year single center study and systematic review of the literature

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Frie foredrag 1, oktober 26, 2023, 09:15 - 10:30

OBJECTIVE: Surgery is the firstline treatment of pediatric brain tumors. To provide safe and effective health services, quantifying and evaluating quality of care are important. The objective of this study was to analyze currently applied quality indicators in pediatric brain tumor surgery and identify factors associated with poor outcome at a tertiary neurosurgical referral center in western Norway.

METHODS: All patients younger than 18 years of age who underwent surgery for an intracranial tumor at the Department of Neurosurgery at Haukeland University Hospital in Bergen, Norway, between 2009 and 2020 were included. The primary outcomes of interest were classic quality indicators: 30day -readmission, -reoperation, -mortality, -nosocomial infection, and -surgical site infection (SSI) rates; and length of stay. The secondary aim was the identification of risk factors related to unfavorable outcome. A systematic review of the literature was performed screening studies for the mentioned outcomes.

RESULTS: 82 patients were included. The 30-day outcomes for unplanned reoperation, unplanned remission, mortality, nosocomial infection, and SSI were 9.8%, 14.6%, 0%, 6.1%, and 3.7%, respectively. Unplanned reoperation was associated with eloquent localization ($p=0.009$), primary emergency surgery ($p=0.003$), and CSF diversion procedures ($p=0.002$). Greater tumor volume was associated with unplanned readmission ($p = 0.008$), nosocomial infection ($p = 0.004$), and CSF leakage ($p = 0.005$). In the systematic review, the 30-day mortality rate was 0%-9.3%, reoperation rate was 1.5%-12%, SSI rate was 0%-3.9%, and 0%-17.4% of patients developed CSF leakage.

CONCLUSIONS:The 30-day outcomes in the department were comparable to published outcomes. Tumor volume and location were risk factors for unfavourable outcomes. This highlights the importance of risk adjustment. This study reveals concerns related to the unclear and nonstandardized definitions of outcomes. Standardized outcome definitions and documentation in a large and multicentric database are needed in the future for further evaluation of quality indicators.

Intriguing Encounters: Metastasis to Meningioma – Cases and review of the literature

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Frie foredrag 1, oktober 26, 2023, 09:15 - 10:30

Introduction:

Metastases are the most common intracranial tumors in adults, accounting for more than one-half of the cases. Brain metastases from prostate cancer are rare, with an incidence of less than 2%. Tumor-to-tumor metastasis, where a primary malignant tumor spreads to another tumor, is exceptionally rare, mostly involving benign tumors like meningiomas. Approximately 150 cases of tumor-to-meningioma metastasis (TTMM) have been reported to date since the first case reported by Fried in 1930. Although virtually any benign or malignant tumor can be a recipient, meningiomas have been cited as the most common intracranial neoplasms to harbor metastasis. In this report, we present two cases of TTMM, originating from prostate and breast cancer, respectively. Furthermore, we conducted a literature review on intracranial metastasis from prostate cancer, given its extreme rarity.

Methods:

We conducted a comprehensive literature review to identify cases of TTMM in prostate cancer. Simultaneously, we retrieved relevant information about our own cases from the medical records of the patients.

Results:

Our first patient with a stable cancer prostatae underwent a resection of two meningiomas, where the largest tumor was identified as a meningioma with TTMM from his primary cancer in the prostate. Our second case involves a woman with resection of a meningioma with TTMM from a progressive cancer mammae. To the best of our knowledge, we identified only 10 cases of prostate cancer with TTMM described in the literature.

Discussion and conclusion:

The etiology of TTMM remains unclear, although certain conditions have been proposed as necessary for its development within the recipient tumor. Despite its rarity, clinicians should be aware of this phenomenon. In over one-third of the cases, TTMM was the first presentation of a previously unknown cancer according to a systematic review. Further research in this topic is required.

Extraneural metastases of Primary Malignant CNS tumors: Case reports, and Literature Review

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Frie foredrag 1, oktober 26, 2023, 09:15 - 10:30

Introduction: Extraneural metastases (ENM) of primary malignant brain tumors are rare, and the biological mechanisms behind them remain insufficiently understood. Surgical intervention and peritoneal seeding through a ventriculoperitoneal shunt have been suggested as routes for dissemination. However, there are cases where metastasis occurs without these procedures, highlighting the need to investigate biological aspects. Previously, some few genomic studies have shown high mutational burden and unique mutations only detected in the metastases, indicating clonal evolution.

Material and Methods: Patient 1, a 55-year-old man with glioblastoma, underwent near-total surgical resection followed by the Stupp protocol. Nine months later, the patient presented with reduced general condition, tachypnea, and lower back pain. Imaging revealed multiple pathological lesions in the mediastinum, bones, lung, soft tissue, and mesentery. Biopsy confirmed ENM from glioblastoma and a bevacizumab-based regimen was initiated.

Patient 2, a 44-year-old man with anaplastic oligodendroglioma, underwent gross total resection, radiation, and adjuvant PCV chemotherapy. After two years of stability, a temporal lesion suspected to be a meningioma was found, but histopathology confirmed relapse. The patient later developed ENM to the pelvic bone and cervical lymph nodes.

Results: In Patient 1 the biopsy showed infiltration of a low differentiated, highly cellular tumor. BRAF wild-type was reported and no NTRK translocation was found, but PD-L1 was significantly upregulated, suggesting a potential benefit of immune-checkpoint inhibitors for ENM. Patient 2's primary tumor was IDH1-mutated and had a 1p/19q codeletion. A literature review revealed that both conditions remain rare. Results of the review will be presented.

Conclusion: We report two rare cases of primary malignant brain tumors with extensive extraneural metastases. To better understand the risk factors and develop appropriate follow-up strategies for this subgroup, it is crucial to compare molecular biology, tumor localization, and other patient and tumor-related factors.

The Norwegian Registry for Spine Surgery (NORspine): cohort profile report

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Frie foredrag 1, oktober 26, 2023, 09:15 - 10:30

Purpose

To review and describe the development, methods and cohort of the lumbosacral part of the Norwegian registry for spine surgery (NORspine).

Methods

NORspine was established in 2007. It is government funded, covers all providers and captures consecutive cases undergoing operations for degenerative disorders. Patients' participation is voluntary and requires informed consent. A set of baseline-, process- and outcome-variables (3 and 12 months) recommended by the International Consortium for Health Outcome Measurement is reported by surgeons and patients. The main outcome is the Oswestry disability index (ODI) at 12 months.

Results

We show satisfactory data quality assessed by completeness, timeliness, accuracy, relevance and comparability. The coverage rate has been 100 % since 2016 and the capture rate has increased to 74 % in 2021. The cohort consists of 60 647 (47.6 % women) cases with mean age 55.7 years, registered during the years 2007 through 2021. The proportions >70 years and with an American Society of Anaesthesiologists' Physical Classification System (ASA) score >II has increased gradually to 26.1 % and 19.3 %, respectively. Mean ODI at baseline was 43.0 (standard deviation 17.3). Most cases were operated with decompression for disc herniation (n = 26 557, 43.8 %) or spinal stenosis (n = 26 545, 43.8 %), and 7 417 (12.2 %) with additional or primary fusion. The response rate at 12 months follow-up was 71.6 %.

Conclusion

NORspine is a well-designed population-based comprehensive national clinical quality registry. The register's methods ensure appropriate data for quality surveillance and improvement, and research.

Upfront Radiosurgery vs a Wait-and-Scan Approach for Small- or Medium-Sized Vestibular Schwannoma. The V-REX Randomized Clinical Trial.

Dhanushan Dhayalan

5 beste abstrakts, oktober 26, 2023, 15:15 - 16:15

BACKGROUND: Current guidelines for treating small- to medium-sized vestibular schwannoma recommend either upfront radiosurgery or waiting to treat until tumor growth has been detected radiographically. We investigate whether upfront radiosurgery provides superior tumor volume reduction to a wait-and-scan approach.

METHODS: Randomized clinical trial of 100 patients with a newly diagnosed unilateral vestibular schwannoma and a maximal tumor diameter of less than 2 cm in the cerebellopontine angle. Participants were randomized to receive either upfront radiosurgery (n = 50) or to undergo a wait-and-scan protocol, for which treatment was given only upon radiographically documented tumor growth (n = 50). The primary outcome was the ratio between tumor volume at the trial end at 4 years and baseline (V4:V0). There were 26 prespecified secondary outcomes, including patient-reported symptoms, clinical examinations, audiovestibular tests, and quality-of-life outcomes.

RESULTS: Of the 100 randomized patients, 98 completed the trial. In the upfront radiosurgery group, 1 participant (2%) received repeated radiosurgery upon tumor growth, 2 (4%) needed salvage microsurgery, and 45 (94%) had no additional treatment. In the wait-and-scan group, 21 patients (42%) received radiosurgery upon tumor growth, 1 (2%) underwent salvage microsurgery, and 28 (56%) remained untreated. For the primary outcome of the ratio of tumor volume at the trial end to baseline, the geometric mean V4:V0 was 0.87 (95% CI, 0.66-1.15) in the upfront radiosurgery group and 1.51 (95% CI, 1.23-1.84) in the wait-and-scan group, showing a significantly greater tumor volume reduction in patients treated with upfront radiosurgery (wait-and-scan to upfront radiosurgery ratio, 1.73; 95% CI, 1.23-2.44; P = .002). Of 26 secondary outcomes, 25 showed no significant difference. No radiation-associated complications were observed.

CONCLUSION: Among patients with small- and medium-sized vestibular schwannoma, upfront radiosurgery demonstrated a significantly greater tumor volume reduction at 4 years than a wait-and-scan approach with treatment upon tumor growth.

Predictive value of manual vs. automatic methods for assessing extents of resection and residual tumour volume in glioblastoma

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5 beste abstrakts, oktober 26, 2023, 15:15 - 16:15

Background:

Extent of surgical resection (EOR) and post-operative residual tumour (RT) are known prognostic factors for survival in patients diagnosed with glioblastoma. Accurate segmentation of RT on the post-operative MRI is essential for accurate prognostication. Automatic segmentation of tumour volume is not perfect when compared to manual segmentation. However, manual segmentation is subject to high inter- and intra-rater variability. The aim of the study was to assess whether automatic assessments are as prognostic as manual volumetric measures.

Methods:

799 adult patients treated with surgical resection of histopathologically confirmed glioblastoma at 3 European neurosurgical centers (in Norway, Sweden and Netherlands) were included in the study. Assessments of tumour volume were performed on pre-operative and early post-operative MRI scans. Automatic segmentation was performed using an online free of charge software developed by our study group. Correlation between manual and automatic tumour volumes was assessed using Spearman's rank correlation coefficient. Cox regression models were used to compare prognostic value of manually and automatically measured EOR and RT, adjusting for age, Karnofsky performance status, and post-operative radiotherapy and chemotherapy. Goodness-of-fit of the models was assessed using the Akaike information criterion (AIC), Bayesian information criterion (BIC), and Harrell's c-index.

Results:

We found a significant correlation between manual and automatic segmentation of preoperative and postoperative tumour volumes, ρ 0.979, 95% CI: 0.976-0.981, $p < 0.001$, and ρ 0.771, 95% CI: 0.741-0.798, $p < 0.001$, respectively. Manual and automatic estimates of EOR and RT had similar prognostic value on overall survival of patients with glioblastoma. Both models showed similar goodness-of-fit (AIC 7490 vs. 7497, BIC 7523 vs. 7530, Harrell's c-index 0.67 vs. 0.66).

Conclusion:

Prognostic properties of manually and automatically measured EOR and RT volumes are comparable. The use of automatic methods is more time efficient and can facilitate future research.

Growth dynamics of untreated meningiomas

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5 beste abstrakts, oktober 26, 2023, 15:15 - 16:15

Growth Dynamics of Untreated Meningiomas

Background

Incidental meningiomas are more often diagnosed than symptomatic meningiomas and knowledge about meningioma growth characteristics is needed for developing biologically rational follow-up routines. In this study of untreated meningiomas followed with repeated MRIs, we studied growth dynamics and explored potential factors associated with tumor growth.

Methods

In a single-center cohort study, we included 235 adult patients with a radiologically suspected intracranial meningioma and at least three MRI scans during follow-up. Tumors were segmented using an automatic algorithm from contrast enhanced T1-series, and if needed manually corrected. Potential meningioma growth curves were statistically compared; linear, exponential, linear radial, or Gompertzian. Factors associated with growth were explored.

Results

In 235 patients, 1394 MRI scans were carried out in the median five-year observational period. Of the models tested, a Gompertzian growth curve best described growth dynamics of meningiomas on group level. 59 % of the tumors grew, 27 % remained stable, and 14 % shrunk. Only 13 patients (5 %) underwent surgery during the observational period. Tumor size at time of diagnosis, multifocality, and length of follow-up were associated with tumor growth, whereas age, sex, presence of peritumoral edema or hyperintense T2-signal were not significant factors.

Conclusion

Meningiomas follow a Gompertzian growth curve, indicating that increasing and potentially doubling of subsequent follow-up intervals between MRIs seems biologically reasonable, instead of fixed intervals. Tumor size at diagnosis is the strongest predictor of future growth, indicating a potential for longer follow up intervals in smaller tumors. Although most tumors grew during the observational period, 14 % shrunk and only 5 % underwent surgery.

Degenerative changes and neck pain-related disability among professional porters and white-collar workers in Nepal.

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5 beste abstrakts, oktober 26, 2023, 15:15 - 16:15

Background: In the medical literature, neck pain is often linked to physical strain and degenerative changes in the cervical spine, even if the scientific evidence is weak. Nepalese professional porters are daily exposed to extreme cervical spinal loads, carrying goods using the traditional head strap around the forehead. The aims of the study were to assess if 1) porters have more neck pain-related disability than white-collar workers 2) if porters have more cervical degeneration on magnetic resonance imaging (MRI) and 3) if the severity of cervical degeneration is associated with neck pain-related disability and pain intensity.

Methods: A cross-sectional, case-control study conducted in Nepal. The primary outcome was a minimal clinically important difference of ≥ 15 on the neck disability index (NDI). Two independent radiologists had assessed ten different findings of cervical degeneration on MRI with acceptable intra- and inter-rater reliability. The association between cervical degeneration and outcomes were analysed by multivariable regression.

Results: Of 126 presumably healthy males evaluated for inclusion, 50 porters and 50 age matched white-collar workers were included. Mean age was 40 years. Porters had on average worked for 15 years, carrying 83 kilograms for 10 hours, 6 days a week. They reported slightly more neck pain-related disability (NDI mean difference 5.4, 95% CI 2.8- 7.9: $p < 0.001$). The prevalence of cervical degeneration was similar between the groups. In the whole study population, none of these findings were associated with more neck pain and disability. Smoking was the only independent prognostic factor (odds ratio 5.0: 95% CI 1.3 - 18.3: $p = 0.016$).

Conclusion: The prevalence of cervical degeneration was similar among professional porters and white-collar workers. The small differences in neck pain-related disability between the groups did not reach clinical relevance. More severe cervical degeneration was not associated with increased neck pain and disability.

Awake craniotomy for diffuse gliomas with continuous dynamic mapping of language function and cognitive control and spatial correlation to white matter tracts

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5 beste abstrakts, oktober 26, 2023, 15:15 - 16:15

Introduction and goal: Continuous dynamic mapping (CDM) is an indispensable tool for mapping of the corticospinal tract (CST). There is, however, no widespread method for CDM of more advanced brain functions.

Material and methods: Patients undergoing awake craniotomy for diffuse gliomas at the Oslo University Hospital with the use of neuronavigation, diffusion tensor imaging (DTI) and CDM coupled with structured evaluation as well as intraoperative magnetic resonance imaging (iMRI) were included in a retrospective analysis. Subcortical CDM was conducted applying monopolar high-frequency stimulation when resection became close to the arcuate fasciculus (AF) and the frontal aslant tract (FAT) with clinical testing using language paradigms and Stroop task. The spatial relationship between the stimulation response and the examined tracts was determined by measuring the shortest distance between the resection cavity and the relevant white matter tracts (WMTs) using iMRI DTI.

Results: Twenty two IDH-mutant and eight IDH wild type gliomas operated 2021-2023 were included in the analysis. Subcortical CDM of the AF and the FAT proved to be amenable as both language function and the ability to perform Stroop test were affected when the stimulation site gradually became close (< 1 cm) to the examined tracts. Positive stimulation response was verified by repeat challenge. The stimulation intensity was thereafter reduced in a stepwise fashion when there was a consistent hesitation in the patient's response. Resection was continued until the tumor border was reached and not beyond the threshold of 3mA. The threshold of stimulation intensity correlated to the minimal distance from the resection cavity to the delineated WMTs. We did not observe any seizure activity induced by CDM.

Conclusion: We have experienced subcortical CDM to be a safe and reliable method, where distance to identified WMT appears to be correlated to the applied stimulation intensity.

Passive or Active Drainage System for Chronic Subdural Haematoma –A Single Center Retrospective Follow-Up Study

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Frie foredrag 2, oktober 26, 2023, 16:15 - 16:45

Background:

Postoperative drainage systems have become a standard treatment for chronic subdural haematoma (CSDH). We previously compared treatment results from three Scandinavian centers using three different postoperative drainage systems, and concluded that the active subgaleal drainage was associated with lower recurrence and complication rates than the passive subdural drainage. We consequently changed clinical practice from using the passive subdural drainage to the active subgaleal drainage.

Objective:

The aim of the present study was to assess a potential change in reoperation rates for CSDH after conversion to the active subgaleal drainage.

Methods:

This single-center cohort study compared the reoperation rates for recurrent same-sided CSDH and postoperative complication rates between patients treated during two study periods (passive subdural drainage cohort versus active subgaleal drainage cohort).

Results:

In total 594 patients were included in the study. We found no significant difference in reoperation rates between the passive subdural drain group and the active subgaleal drain group (21.6%, 95% CI 17.5-26.4% vs. 18.0%, 95% CI 13.8-23.2%; $p = 0.275$). There was no statistical difference in the rate of serious complications between the groups.

Conclusions:

Conversion from the passive subdural to the active subgaleal drainage did not result in a clear reduction of reoperation rates for CSDH in our center.

C1 osteosyntese

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Frie foredrag 2, oktober 26, 2023, 16:15 - 16:45

Background

Fractures of the C1 ring are rare (1% of all bony spine injuries), yet make up 25% of injuries in the craniocervical junction. In roughly half of cases they are accompanied by fractures of the odontoid or body of the axis. Their treatment is controversial and complex, both due to a multitude of fracture morphologies, as well as frequent concomitant injuries in the adjacent spine. No international recognized guideline exists to date. C1 fractures that are accompanied by rupture of the transverse axial ligament (TAL) are often considered too unstable for non-operative treatment. Historically these injuries are treated by C1-C2 fusion, leaving the patient with considerable morbidity due to reduction in axial head rotation of more than 50%. Recently a German guideline was published, incorporating the possibility of a primary reduction and internal fixation of the C1 ring, instead of a C1/C2 fusion.

Methods

This is a case presentation of a C1 osteosynthesis performed at our unit. The biomechanical background for the procedure will be discussed. The existing literature is reviewed and a recent European guideline will be presented.

Results

The procedure was pioneered by Ruf in 2003. One biomechanical feasibility study was performed in 2010. Since then several case reports have been published, and in 2022 a randomized controlled trial with 5 year follow-up reported promising results. In 2018 C1 fracture treatment guidelines were published by Kandziora et. al, incorporating the option of a C1 osteosynthesis.

Conclusion

Based on the current literature, C1 osteosynthesis seems a viable option in patients with isolated C1 fractures with a concomitant TAL rupture. The procedure reestablishes an intact C1 ring, and secondary ligamentous stabilizers prevent a postoperative translation of C1 over C2. The patient retain most of their axial rotational range and report little postoperative disability.

Worsening of neck pain-related disability after surgery for degenerative cervical myelopathy: A nationwide study of 1508 patients.

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Frie foredrag 2, oktober 26, 2023, 16:15 - 16:45

BACKGROUND: Functional status, pain and quality of life usually improve after surgery for degenerative cervical myelopathy (DCM), but a subset of patients report worsening.

OBJECTIVE: To define cut-off values for worsening on the Neck Disability Index (NDI) and identify prognostic factors associated with worsening of pain-related disability 12-months after DCM surgery.

METHODS: In this prognostic study based on prospectively collected data from the Norwegian Registry for Spine Surgery, the NDI was the primary outcome. Receiver operating characteristics curve analyses were used to obtain cut-off values, using the global perceived effect scale as an external anchor. Mixed logistic regression was used to evaluate the relationship between potential prognostic factors and the primary outcome.

RESULTS: Among the 1508 patients undergoing surgery for myelopathy, 1248 (82.7%) were followed for either 3- or 12 months. Of these, 317 (25.4%) were classified to belong to the worsening group according to the mean NDI percentage change cut-off of 3.3. Multivariable analyses showed that smoking (odds ratio (OR) 3.4: 95% confidence interval (CI) 1.2 to 9.5: $P < .001$), low educational level (OR 2.5: 95% CI 1.0 to 6.5: $P < .001$), and American Society of Anesthesiologists (ASA) grade $> II$ (OR 2.2: 95% CI 0.7 to 5.6: $P = .004$) were associated with worsening. Patients with severe neck pain (OR 0.8: 95% CI 0.7 to 1.0: $P = .003$) and arm pain (OR 0.8: 95% CI 0.7 to 1.0; $P = .007$) were less likely to report worsening.

CONCLUSION: We defined a cut-off value of 3.3 for worsening after DCM surgery using the mean NDI percentage change. The independent prognostic factors associated with worsening of pain-related disability were smoking, low educational level, and ASA grade $> II$. Patients with more severe neck- and arm pain at baseline were less likely to report worsening at 12-months.

Endovascular treatment of Dural Arteriovenous Fistulas at Haukeland University Hospital.

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Frie foredrag 2, oktober 26, 2023, 16:15 - 16:45

Dural arteriovenous fistulas (DAVFs) are now in most western centers treated primarily by endovascular techniques, which is also the primary treatment modality in our institution. We have performed a retrospective analysis of all DAVFs treated in our hospital to determine the quality of endovascular treatment of these pathologies.

From 2007 to 2021, 69 DAVFs were treated at our hospital. 55 of these were treated using endovascular techniques (79.7%) and 14 were treated by open surgery. 10 of the endovascular treatments (18.2%) were in acute ruptured DAVFs. We also treated 14 direct CC-fistulas in the same period by endovascular technique.

34 (61.8%) of the endovascularly treated DAVFs were high-grade (Cognard \geq IIb), whereas 21 (38.2%) were low-grade (Cognard I/IIa). The most common location of fistulas were at the transverse/sigmoid sinus (18, 32.7%) and at the cavernous sinus (14, 25.5%).

Most fistulas (n=32, 58.2%) were treated transarterially. DAVFs located in the cavernous sinus were treated using coils whereas most other DAVFs were treated with liquid embolics either alone or in combination with coils.

Complete or near-complete cure was achieved in 41 treatments (74.1%) whereas 13 treatments (18.3%) resulted in downgrading of the fistula. 12 patients were retreated once (nine endovascularly) and one patient was retreated twice. After retreatments complete or near-complete cure was achieved in 38 patients (86.4%). 40 treatments (72.7%) were performed without any remnant or retreatment.

There were no procedure related deaths and only one patient (1.4%) suffered a complication resulting in permanent neurological deficits. Nine other complications (12.7%) were recorded which all were asymptomatic or caused only temporary symptoms.

Our results are in line with reports in the literature from larger centers providing high quality endovascular treatment of DAVFs with high cure rates and low retreatment- and complication rates.

Reoperation-requiring postoperative haemorrhage after posterior fossa craniotomy: retrospective case-series

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Frie foredrag 3, oktober 27, 2023, 09:00 - 10:00

Introduction

Studies report rates of treatment-requiring postoperative intracranial haemorrhage after craniotomy around 1-2%, but do not distinguish between supratentorial and posterior fossa operations. Reports about haemorrhages' temporal occurrence show conflicting results. Recommendations for duration of postoperative monitoring vary.

Material and Methods

This retrospective case-series identified cases operated with posterior fossa craniotomy or craniectomy between 1 January 2007 and 31 December 2021 by an electronic search in the patient administrative database, and collected data about patient- and treatment characteristics, postoperative monitoring, and the occurrence of haemorrhagic and other serious postoperative complications.

Results

We included 60 (n=33, 55% women) cases with mean age 48 (interquartile range 48) years operated for tumours (n=32, 53%), Chiari malformations (n=18, 30%), ischemic stroke (n=6, 10%) and other lesions (n=3, 5%). One (2%) 66-year-old woman who was a daily smoker operated with decompressive craniectomy and infarct resection, developed a reoperation-requiring postoperative haemorrhage after 25.5 hours. In three (5%) cases, other serious complications requiring reoperation or transfer from the post anaesthesia care unit or regular bed wards to the intensive care unit occurred after 0.5, 6 and 24 hours, respectively.

Discussion and Conclusion

Treatment requiring postoperative haemorrhage and other serious complications after posterior fossa craniotomies occur over a wide timespan and are difficult to capture with a standardized postoperative monitoring time. This indicates that the duration of monitoring should be individualized based on assessment of risk factors.

Volumetric differences in target definition of malignant brain tumors using contrast enhanced MRI vs. [18F]FDOPA PET

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Frie foredrag 3, oktober 27, 2023, 09:00 - 10:00

Background: Radiosurgical treatment of malignant brain tumors usually bases target definition on contrast-enhanced T1-weighted MRI images. Despite advances in MRI techniques, a number of limitations exist, making the target delineation less accurate, particularly when treating recurrences. Several studies support the use of amino acid PET/MRI in distinguishing progression from post-operative/post-radiation inflammation. No established guidelines define the biological target volume when using amino acid PET/MRI in radiosurgical treatment planning.

We aimed to explore the volumetric differences in target volumes obtained with standard contrast-enhanced MRI versus [18F]FDOPA PET in patients with recurrent high-grade gliomas (rHGG) and in newly diagnosed brain metastases.

Methods: Twenty-one patients (9 rHGG, 12 metastases) obtained [18F]FDOPA PET/MRI within 1 week before radiosurgical treatment. We co-registered these images with the 3D MPRAGE-MRI typically used for stereotactic target definition and performed a follow-up PET/MRI scan 4-6 weeks after treatment. We compared the method of tumor delineation, target volumes, and stereotactic accuracy in both modalities.

Results: Radiosurgical treatment delivers high radiation doses to defined targets. The target volume and the proximity to eloquent structures limit the dose, thus depending on high-accuracy imaging. The invasive nature of malignant brain tumors makes anatomical delineation insufficient, particularly when treating recurrences. In such cases, amino acid PET supplies useful additional information. However, the spatial resolution afforded by [18F]FDOPA uptake alone is insufficient for stereotactic definition, which is based on contrast-enhanced T1-weighted MRI. While [18F]FDOPA-PET is not as sensitive as contrast-enhanced T1-weighted MRI in detecting micrometastases, [18F]FDOPA-PET is useful in the target delineation of rHGG.

Hybrid PET/MRI combines the metabolic information of [18F]FDOPA-PET with the anatomical precision of stereotactic MRI and should be routinely implemented when treating patients with rHGG. Standardized methods for image coregistration and analysis are needed.

Is there a Weekend Effect in Severe Traumatic Brain Injury? An observational, population-based study from the Norwegian Trauma Registry

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Frie foredrag 3, oktober 27, 2023, 09:00 - 10:00

Background

Admissions of severe TBI reach a peak during weekends, typically affecting younger patients. The term “weekend effect” with increased morbidity and mortality occurring during weekends has been related to various medical disorders and conflicting results in trauma patients.

The aim of this study was to explore patient characteristics and outcome and a possible weekend effect on the mortality of severe TBI in Norway based on population-based data from a national trauma database.

Methods

This study is an observational cohort study based on the prospectively maintained National Trauma Registry of Norway (NTR). The study period was between 01.01.2017 and 31.12.2020 and included all patients with an Glasgow Coma Scale (GCS) ≤ 8 , Abbreviated Injury Scale (AIS) score for head injuries of ≥ 3 or more and Injury Severity Score (ISS) ≥ 13 .

Results

A total of 627 patients were included and most patients were admitted on weekdays (58%) compared to weekends (42%). Weekend admissions had a significantly younger patient cohort (50.0 years, IQR 29.5-65.0, $P=0.013$) compared to weekdays (57.0 years, IQR 33.0-74.0). Weekday admissions had higher proportion of patients over 65 years ($P<0.001$). On weekend, the most frequent causes of injury were high-energy falls ($n=95$, 36%), high-energy falls and road traffic incidents were equally predominant on weekdays ($n=198$, $n=201$ respectively, both 32%). Both groups had similar injury severity with a median GCS of 6 and majority of patients had a critical AIS head injury severity (weekday $n=222$, 61% vs weekend $n=155$, 59%).

The 30-day mortality of all patients was 39% ($n=246$). There was a significant difference ($p=0,025$) in mortality with weekday admissions demonstrating higher mortality (43% versus 34%).

Conclusion

In this study there appeared to be no weekend effect and in fact weekday admissions were associated with higher mortality. Standardized trauma-care with all-hours rapid response likely plays a factor.

Decreasing incidence of cervical spine fractures in patients with ankylosing spondylitis: A population-based study in Southeast Norway

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Frie foredrag 3, oktober 27, 2023, 09:00 - 10:00

Introduction: Individuals with ankylosing spondylitis (AS) face an increased risk of spine fractures, specifically cervical spine fractures (CS-Fxs). In the past two decades, biological disease-modifying antirheumatic drugs (bDMARDs) have provided considerable relief from pain for a large segment of AS patients. It remains unclear whether extended use of bDMARDs can reduce the risk of spine fractures. We aimed to investigate the patterns and epidemiology of traumatic CS-Fxs in both AS and non-AS populations.

Methods: Data regarding all CS-Fxs diagnosed between 2015 and 2022 were extracted from the Southeast Norway population-based quality control database for traumatic CS-Fxs. The Wilcoxon rank-sum test was used to compare continuous variables, and the chi-squared test and Fischer exact test were used to compare categorical variables. To investigate the trend in the incidence of fractures, two different Poisson models were fitted with the number of non-AS and AS fractures as dependent variables and the year as the explanatory variable.

Results: We registered 3622 CS-Fxs in 3598 patients, with AS patients accounting for 125 of these fractures. AS patients presented a 9-fold and 8-fold higher risk of initial and subsequent CS-Fxs, compared with non-AS patients. We observed a declining trend in AS-related CS-Fxs with an annual decrease of 8.4% ($p=0.026$), whereas non-AS-related CS-Fxs showed an annual increase of 3.7% ($p<0.001$). AS patients sustaining CS-Fxs were older, predominantly men, and more frequently injured due to falls. They showed a higher prevalence of subaxial CS-Fxs, fewer C0-C2 CS-Fxs, a higher rate of surgical fixation and spinal cord injury. The 30-day mortality rate was 11% in AS patients and 5.4% in non-AS patients.

Conclusions and discussion: This study confirms the elevated risk of CS-Fxs among AS patients, although this risk appears to show a decreasing trend. The most plausible explanation for this risk reduction is the widespread application of bDMARDs.

Salvage microsurgery after failed radiosurgical treatment of vestibular schwannoma; a multi-institutional study

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Frie foredrag 3, oktober 27, 2023, 09:00 - 10:00

Title: Salvage microsurgery after failed radiosurgical treatment of vestibular schwannoma; a multi-institutional study

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Background: The success rate of radiosurgery (SRS) in vestibular schwannoma (VS) is close to 95 %, meaning that approximately one in 20 patients are potentially in need of salvage treatment. There are considerable controversies on the management of these patients as the literature is sparse and confounded by personal opinions from experts. We aimed to gather a large number of patients treated with microsurgery following primary SRS and describe their clinical outcomes.

Methods: We identified patients treated with microsurgery following failed initial SRS at seven tertiary referral centers across the United States and Norway and did a retrospective review of the charts, electronic medical journals and radiology information systems.

Results: We identified 126 patients treated with salvage microsurgery following initial SRS. The median age at microsurgery was 62 years (IQR 53-70), with the majority (97%) having tumors that extended into the cerebellopontine angle at the time of salvage. Most (76%) underwent primary Gamma Knife SRS, while 14% underwent CyberKnife SRS. Data on postoperative complications such as CSF-leak, hydrocephalus, and meningitis and postoperative results such as degree of resection, facial nerve outcomes, and long-term tumor control rates will be presented.

Discussion and conclusion: Salvage microsurgery following failed SRS is a risk factor for long-term facial paresis, and the complication rates are generally higher compared to salvage/repeat SRS. Possible confounders are tumor size and patient characteristics.

Resultater etter behandling av ikke-rumperte intrakranielle aneurismer - En syntese av systematiske litteraturgjennomganger

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Frie foredrag 3, oktober 27, 2023, 09:00 - 10:00

BAKGRUNN

Ikke-rumperte intrakranielle aneurismer kan oppdages som tilfeldige funn ved utredning av andre tilstander, eller ved screening på bakgrunn av familiær belastning eller kjente risikofaktorer. Ruptur av et intrakranielt aneurisme kan føre til aneurismal subarachnoidalblødning, en potensielt livstruende tilstand som uten adekvat og tidsriktig behandling har høy dødelighet. Tidlig sikring av aneurismet forebygger reblødning og kan være livreddende for dem som overlever den første blødningen. Videre er det en risiko forbundet med behandlingsprosedyren. Målet med denne studien er derfor å innhente kunnskap om risiko for morbiditet og mortalitet knyttet til forebyggende behandling av ikke-rumperte intrakranielle aneurismer.

MATERIAL OG METODE

Litteraturgjennomgang som oppsummerer tidligere systematiske litteraturgjennomganger og metaanalyser med resultater etter behandling av ikke-rumperte intrakranielle aneurismer, publisert i tidsrommet 2005-2021. Dette er en narrativ syntese, hvor hovedutfallsmålene det redegjøres for er funksjonsnivå angitt som modified Rankin Scale, Glasgow Outcome Scale eller Glasgow Outcome Scale Extended skår ≥ 1 år etter behandling, samt dødelighet ≤ 30 dager etter gjennomgått behandling.

RESULTATER

Dødelighet ≤ 30 dager etter endovaskulær coiling av et ikke-rumpert intrakranielt aneurisme er om lag 1%, og ved mikrokirurgisk klipsing om lag 1-2%. Mortalitetsrate ≤ 30 dager totalt for endovaskulær og mikrokirurgisk behandling er funnet å være anslagsvis på 1%. Andelen med dårlig utfall ett år etter behandling er ved endovaskulær coiling funnet å være om lag 5%, og ved mikrokirurgisk klipsing om lag 0-8%. Totale morbiditetsrater for hele populasjonen inkludert i alle originalstudiene er anslagsvis 5%.

FORTOLKNING

Per i dag finnes ingen veletablerte pasientregistre som rapporterer data fra behandling av ikke-rumperte intrakranielle aneurismer. For å få god oversikt over disse behandlingsresultatene er det aktuelt å etablere et slikt register. Ved Universitetssykehuset Nord-Norge pågår det arbeid med å utvide et allerede etablert pasientregister til et nasjonalt kvalitetsregister i Norge.

Radiosurgery as a single option in large vestibular schwannoma - where is the limit?

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Frie foredrag 4, oktober 27, 2023, 11:15 - 12:00

BACKGROUND: Conventionally, radiosurgery is limited to treating only small- and medium-sized vestibular schwannomas. However, there is growing evidence that radiosurgery as monotherapy has a role even in large vestibular schwannomas. The upper size limit for radiosurgery in large VS is not defined.

OBJECTIVE: To investigate the recent literature on 1) radiosurgical treatment as a single option for large vestibular schwannomas and compare the outcomes with 2) microsurgery and 3) the hybrid approach involving microsurgery and radiosurgery for more minor tumor remnants.

METHODS: We reviewed all PubMed-indexed publications from 2015 to 2023 regarding radiosurgery on large vestibular schwannomas (n=115) and analyzed the local database of vestibular schwannoma treatment.

RESULTS: Based on the current evidence, all treatment strategies for large vestibular schwannomas result in high and comparable tumor control rates. The hearing prognosis is poor regardless of the treatment strategy. Microsurgery with the goal of gross total removal results in a higher rate of facial nerve impairment compared with radiosurgery or the hybrid approach. Volumetric measures, symptoms, comorbidities, and the preferences of the surgeon and patient should guide the treatment strategy, not linear measurements and grading systems such as the Koos grade.

CONCLUSION: It is not easy to draw a strict line that dictates the management strategy in large vestibular schwannomas; even defining what is "large" is challenging. Radiosurgery as a single option certainly plays a role. Tumor volume, symptoms, comorbidities, and the treatment center's preferences are more important than tumor grading systems. Decision-making in multidisciplinary teams is crucial.

Image-guided and image-verified asleep deep brain stimulation (DBS) surgery for movement disorders at Oslo University Hospital- review of 94 consecutive cases

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Frie foredrag 4, oktober 27, 2023, 11:15 - 12:00

Aim: Image-guided and image-verified asleep deep brain stimulation (DBS) surgery mandates high stereotactic accuracy, as placement of the intracranial electrodes in the intended target, is critical for good clinical outcome. To this end, we reviewed our accuracy and safety after converting to this surgical method.

Methods: All patients who underwent asleep DBS surgery with high-resolution intraoperative CT for movement disorders at the Oslo University Hospital in 2021-2022 were prospectively included in the study. Electrode trajectories were planned using dedicated 3T MR images. The electrodes were placed using a Leksell Vantage stereotactic frame and their position was reviewed intraoperatively. Stereotactic coordinates of the electrode tip were compared to the planned trajectory and absolute errors calculated in all three planes as well as the resulting three-dimensional (3D-) error. The electrodes were replaced if the 3D error was more than 2 mm and the stimulation points did not reach the intended anatomical target. Patients were followed up at regular intervals and surgical complications were documented.

Results: Ninety four adult patients underwent DBS surgery with placement of 182 electrodes to the subthalamic nucleus (STN, 57 patients), caudal zona incerta (cZi, 23) and the internal segment of Globus Pallidus (GPi, 14). The mean 3D Euclidian errors were $0,9 \pm 0,4$ mm and $0,7 \pm 0,3$ mm for STN, $0,9 \pm 0,4$ mm and $1,1 \pm 0,5$ mm for cZi, and $1,0 \pm 0,4$ mm and $1,1 \pm 0,7$ mm for GPi for the left and right electrodes respectively. The left electrode deviated posteriorly and the right in posteromedial direction. Four electrodes (3%) were replaced after intraoperative CT. Wound infection rate was low and there was no major intracerebral hemorrhage (>2 cm).

Conclusion: We have experienced image-guided and image-verified asleep DBS surgery to be a safe procedure with highly satisfactory surgical results.

Beta-sitosterol as a potential treatment of brain metastases: A review of the literature and case report

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Frie foredrag 4, oktober 27, 2023, 11:15 - 12:00

Introduction: Beta-sitosterol has been studied in randomized controlled trials in conditions such as hypercholesterolemia and benign prostatic hyperplasia. It has also demonstrated therapeutic potential across a range of different cancers. Notably, beta-sitosterol penetrates the blood brain barrier and may have a role in the treatment of brain metastasis where it has been shown to disrupt metabolism.

Material and methods: We studied a patient with brain metastases who has remained progression free for many years after starting beta-sitosterol treatment and conducted a review of the potential anticancer effects of beta-sitosterol.

Results: A 46-year-old female was diagnosed with estrogen receptor positive, progesterone receptor negative and HER2-positive breast cancer in 2008. She received systemic treatment for around a year before fifty brain metastases were detected. She subsequently underwent whole brain radiotherapy as well as several rounds of surgery and stereotactic radiotherapy supplemented by systemic therapies. She was not free from disease in 2017 when treatment was stopped due to a lot of side effects. At her own initiative, she decided to start using beta-sitosterol the same year. She bought a dietary supplement containing a phytosterol complex with 375 mg beta-sitosterol, and has since used 1.5 g per day. She has been progression free since and has in total survived for 15 years after being diagnosed with brain metastases.

Conclusion: We here present a review of the potential anticancer use of beta-sitosterol and an extremely long-term survivor of brain metastasizing breast cancer which has been using beta-sitosterol for several years without cancer relapse.

Care pathways and factors associated with interhospital transfer to neurotrauma centers for patients with isolated moderate-to-severe traumatic brain injury: a population-based study from the Norwegian Trauma Registry

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Frie foredrag 4, oktober 27, 2023, 11:15 - 12:00

Background: Patients with moderate-to-severe traumatic brain injury (TBI) presenting to general hospitals (GHs) frequently trigger telephone consultations with neurosurgeons. However, the case-mix GHs manage is sparsely characterized, and what determines non-transfer or transfer to neurotrauma centers (NTCs) is poorly described and lacks guideline support. This knowledge is a prerequisite to assessing TBI patients' care continuity. Therefore, this study aimed to investigate case-mix, care pathways, and identify factors associated with interhospital transfer to NTCs for patients with isolated moderate-to-severe TBI in Norway.

Methods: A population-based cohort study from the Norwegian Trauma Registry (2015-2020) of adult patients (≥ 16 years) with isolated moderate-to-severe TBI (Abbreviated Injury Scale [AIS] Head ≥ 3 , AIS Body ≤ 2 and maximum 1 AIS Body=2). Patient characteristics and care pathways were compared across transfer status strata. A generalized additive model was developed using purposeful selection to adjust for confounders to identify factors associated with transfer and how they influenced transfer probability.

Results: The study included 1735 patients admitted to GHs, of whom 692 (40%) were transferred to NTCs. Transferred patients were younger (median 60 vs. 72 years, $P < 0.001$), more severely injured (median New Injury Severity Score [NISS]: 29 vs. 17, $P < 0.001$), and had lower admission Glasgow Coma Scale (GCS) scores (≤ 13 : 55% vs. 27, $P < 0.001$). Increased transfer probability was significantly associated with reduced GCS scores, comorbidity in patients < 77 years, and increasing NISSs until the effect was inverted at higher NISSs. Decreased transfer probability was significantly associated with increasing age and comorbidity, and distance between the GH and the nearest NTC, except for extreme NISSs.

Conclusions: GHs managed a substantial burden of isolated moderate-to-severe TBI patients primarily and definitively, highlighting the importance of high-quality neurotrauma care. The transfer decision was influenced by injury severity, preinjury health status, and transfer distance. Analyses were restricted to registry variables, leaving other factors to be explored.

Acute odontoid fractures – proposal of treatment algorithm

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Frie foredrag 4, oktober 27, 2023, 11:15 - 12:00

Background

Odontoid fractures (OFx) comprise 20 % of all traumatic cervical spine fractures (CSFx) and are the most common CSFx in the elderly. To date, there are no established guidelines for management of OFx. We have recently proposed a new treatment algorithm for OFx in order to better tailor the decision for surgical fixation. We here present data on compliance and clinical outcome using this algorithm.

Methods

This is a population-based observational cohort study of all OFxs diagnosed in HSØ in 2022. Compliance to the treatment algorithm and clinical outcomes were studied.

Results

We identified 87 patients with OFx, 89 % were elderly (≥ 65 years), 2/3 had severe comorbidities, and 1/3 needed assistance with ADL. Primary treatment was rigid collar only in 43/49 (88%) patients with type 2 fracture and 34/36 (94%) in patients with type III fracture. Compliance to the proposed treatment algorithm was 97%. The reasons for non-compliance were delayed diagnosis in one patient and unknown for two patients. At follow-up (median 6 months), 66 patients (76 %) were alive. No patients had new-onset SCI. Eleven patients had radiological pseudarthrosis (lack of fusion and pathological movement), whereof only two had symptoms of neck pain. Secondary surgery was performed in 2/87 (2.3%) patients. There was no significant difference between treatment groups regarding proportion of pseudarthrosis or degree of neck pain.

Conclusions

The level of compliance to the proposed new treatment algorithm was high, and the clinical outcomes were comparable to other published results, despite the low rate of surgical fixation.