PROGRAM

ÅRSMØDE

24. maj 2024

IBC Innovationsfabrikken

Dansk Rygkirurgisk Selskab

DRKS 2024

DANSK RYGKIRURGISK SELSKABS
ÅRSMØDE 24. MAJ 2024
IBC INNOVATIONSFABRIKKEN i KOLDING, DANMARK

INDHOLD

PROGRAM FREDAG 24. MAJ

08:30 - 09:25 Kaffe og brød / udstilling

09:25 - 09:30 Velkommen (Mikkel Mylius Rasmussen)

09:30 - 10:15 Præsentation af danske rygkirurgiske ph.d. afhandlinger 2023
Sessionsformand: Peter Udby

- Kamilla Truong, Hjerne- og rygkirurgi, Aarhus Universitetshospital. **"Medial Branch Nerve Denervation by Cryoneurolysis and Radiofrequency in Patients with Facetogenic Chronic Low Back Pain"**

- Signe Elmose, Rygcenter Syddanmark, Sygehus Lillebælt. **"Segmental instability in the degenerative lumbar spine".**

- Niklas Tønnevold, Rygsektionen, Rigshospitalet, Blegdamsvej. **"Surgical treatment of neuromuscular scoliosis"**

10:15 - 10:45 Hvad skal der til for at kunne kalde sig rygkirurg - et oplæg fra uddannelsesudvalget.
v/ uddannelsesudvalget (Thomas Andersen, Gudrun Gudmunsdottir, Andreas Andresen, Rares Miscov)

10:45 - 11:15 Kaffe / udstilling

11:15 - 12:15 Generalforsamling (kun for medlemmer)

12:15 - 13:15 Frokost

PROGRAM FREDAG 24. MAJ

Theme – "Spondylolisthesis – to fuse or not to fuse"

13:15 - 13:20	Introduction: Mikkel Mylius Rasmussen
13:20 - 13:35	*Anatomy, grade and symptomatology of degenerative spondylolisthesis.* **Andreas Andresen, overlæge, ph.d., Rygcenter Syddanmark, Sygehus Lillebælt**
13:35 - 13:55	*Decompression with or without Fusion in Degenerative Lumbar Spondylolisthesis.* **Ivar Austevoll, Haukeland Universitetshospital, Bergen, Norge**
13:55 - 14:15	*Fusion in Degenerative spondylolishtesis - thoughts and reflections.* **Jon Kaspersen, overlæge, ortopædkirurgisk afdeling, Aalborg Universitetshospital**
14:15 - 14:30	Panel discussion: Optimal treatment choice in spondylisthesis patients
14:30 - 14:45	Kaffe / udstilling
14:45 - 15:20	Forskningsnetværket – status fra det nationale forskningsnetværk og diskussion
15:20 - 16:20	Free papers; foredragskonkurrence *Sessionsformand: Eva Posner*
16:20 - 16:30	Pris for bedste fremlæggelse

Tak for i år

HUSK AT BESØGE UDSTILLING

DANSK RYGKIRURGISK SELSKAB

ÅRSMØDE 2024

DANSKE RYGKIRURGISKE PH.D. AFHANDLINGER 2023

Sessionsformand: Peter Udby

09:30 - 10:15

Kamilla Truong

Hjerne- og rygkirurgi, Aarhus Universitetshospital.

"Medial Branch Nerve Denervation by Cryoneurolysis and Radiofrequency in Patients with Facetogenic Chronic Low Back Pain"

Signe Elmose

Rygcenter Syddanmark, Sygehus Lillebælt.

"Segmental instability in the degenerative lumbar spine"

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"Surgical treatment of neuromuscular scoliosis"

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Hjerne- og rygkirurgi, Aarhus Universitetshospital.

"Medial Branch Nerve Denervation by Cryoneurolysis and Radiofrequency in Patients with Facetogenic Chronic Low Back Pain"

Low back pain is the most common musculoskeletal complaint in health care, accounting for 570 million cases globally. Most low back pain episodes are self-limiting, but 7% of people with low back pain will develop chronic low back pain, with the facet joints being a common source of pain for up to 41%. First-line management of chronic low back pain is conservative treatment (114), yet pain can persist even after sufficient attempts. Surgery is still the final step in pain management, but technological medical advances have paved the way for more accurate and less invasive surgical options (2). Minimally invasive procedures such as radiofrequency denervation and cryoneurolysis are of great interest.

Given that pharmacological ("conservative") therapies might result in tolerance, dependency or clinical side effects, radiofrequency denervation and cryoneurolysis are considered alternative options. This study is the first randomized controlled trial to assess the effectiveness of cryoneurolysis in managing chronic low back pain over a 12-month follow-up period. The main findings concluded that cryoneurolysis was less effective than placebo or radiofrequency denervation in managing chronic low back pain derived from the facet joints. Only at the 6-month follow-up was there a statistically significant difference in impression of change for cryoneurolysis compared with placebo. Among the three groups, no differences were found in pain intensity, function, health status, quality of life or depression score after 12-month follow-up. The addition of physical therapy made no significant difference in outcome. However, in the systematic review, which included 50 randomized controlled trials, a short-term effect of radiofrequency denervation was found on pain intensity and function compared to placebo for chronic low back pain derived from the facet joint. Therefore, a clinically relevant short- and intermediate-term effect of cryoneurolysis or radiofrequency denervation on facetogenic chronic low back pain cannot be excluded; however, careful consideration is urged before conducting larger studies in the future.

Signe Elmose

Rygcenter Syddanmark, Sygehus Lillebælt.

"Segmental instability in the degenerative lumbar spine"

Introduction: Degenerative lumbar spinal stenosis (LSS) is a common condition and the most frequent indications for spine surgery amongst the geriatric population. Approximately 10 % of the patient population have additional spondylolisthesis (LDS). Some patients have a complicating dynamic component of segmental instability with excessive movement between vertebrae. Instability is poorly defined. The present preferred diagnostic modality for LSS is MRI. The supine non weight-baring position during an MRI can cause reposition of the translated vertebrae, hereby overlooking instability. Studies have revealed MRI findings associated with instability. Controversy exist over whether patients with segmental instability associated with their LSS can be treated with spinal decompression alone or they need an additional stabilizing fusion procedure. The controversies regarding segmental instability raises some interesting questions which this thesis aims to answer. Paper 1 aim to systematically describe the definitions of segmental instability in patients with LSS and/or LDS and identify the most frequent thresholds for segmental motion. Paper 2 aims to investigate whether findings on MRI can be proxies (MRIPs) for segmental instability in patients with LSS and/or LDS. Paper 3 investigates if patient reported outcomes (PROs) at five-years after surgery are associated with the presence of preoperative MRIPs for segmental instability in patients with LSS treated with decompression alone.

Method: Paper 1 was a systematic review conducted according to the (PRISMA) guidelines. Paper 2 was a retrospective cohort study on patients with LSS or LDS undergoing decompressive surgery +/- fusion. Patients were divided into two groups according to presence of instability, defined as radiographic translation >3mm. Potential MRIPs for instability: sagittal translation >3mm, facet joint angle (FJA,°), facet joint effusion (mm) and disc height index (DHI, %). Thresholds for MRIPs were determined by ROC curves and AUC. Paper 3 was a retrospective cohort study on Danish and Swedish patients with LSS undergoing decompression surgery. Patients no translation on preoperative MRI and enrolled in the Danish or Swedish national spine surgical database with five-year follow-up were identified. Patients were divided into two groups based upon absence (MRIP(-)) or presence (MRIP(+)) of MRIPs and propensity matched. Changes in Patient Reported Outcomes (PROs) on health-related quality of life including disability and pain scores at baseline and follow-up were analyzed.

Results: Paper 1 included 118 studies for data extraction. Grouping the definitions of segmental instability according similarities showed that 24% defined instability by dynamic sagittal translation, 26% dynamic translation and dynamic angulation. The most frequently reported threshold for dynamic sagittal translation was >3mm and >10º for dynamic angulation. Paper 2 included 232 patients, 47 Stable group and 185 Unstable group. Optimal thresholds for MRIPs were determined to be bilateral FJA ≥46°, bilateral facet effusion ≥1.5mm and DHI ≥13%. There were statistically significant association between instability and MRIPs. ROC curve AUC: 0.95. Statistically significant association between instability and MRIPs also without MRI translation. ROC curve AUC: 0.76. Paper 3 included 104 patients, 83 MRIP(-) and 21 MRIP(+). Propensity matching resulted in 21 in each group. Patients in MRIP(+) group had statistically significant worse VAS leg scores at five years (38.8) compared to MRIP(-) (13.13) p=0.024.

Conclusion: Despite a reputation of non-consensus, segmental instability in the degenerative lumbar spine can radiologically be defined as >3mm dynamic sagittal translation. Presence of MRIPs showed excellent ability to predict instability on standing radiograph. Even without MRI translation the MRIPs had a good ability to predict instability. In patients with LSS and translation <3mm, presence of MRIPs for instability preoperatively may be associated with less improvement in leg pain five years after surgery after decompression only. However, presence of MRIPs did not influence negatively on other PROMs.

Niklas Tønnevold

Rygsektionen, Rigshospitalet, Blegdamsvej.

"Surgical treatment of neuromuscular scoliosis"

Development of spinal deformities can be seen in several disorders that affect either the nervous or muscular systems. The presence of both hyper- and hypotone musculature during growth may result in deformation of the spine. A spine deformity in a person with a disease of the muscle or nervous system is classified as a neuromuscular scoliosis (NMS).[1–3]. As the spinal deformity is a symptom of an underlying disease rather than an isolated pathology the comorbidities in this population is staggering. With nearly 80% of the surgically treated patients being wheelchair bound and a third with tracheostomy, this is an already frail population.[4] In addition some diseases also cause heart and respiratory failure at an early age.[5]

The main goals of surgical treatment of NMS is to stabilize the spine in both the sagittal and coronal plane over a balanced pelvis. [1,6,7] This is done to maintain and potentially maximize pulmonary function, sitting ability and ease the handling and care of the patient. Several studies have shown that surgical treatment increases quality of life in the NMS patients. [8–10]A newer study have even found the treatment to be cost efficient [11] However surgical treatment of these patients is not without risk. Complication rates have been recorded from 4% to 18%[12–14] with readmission rates within 60 days at 16%[14]. Mechanical failure is seen in up to 29% typically at the L5/S1 junction[15] although it have been suggested that revision rates are declining with optimization of the surgical techniques.[16]

Postoperative treatment of this heterogenetic group of patients is without international consensus. The British Thoracic Society recommends postoperative care to include transfer to a specialized intensive care unit (ICU).[17] Some studies does however advocate that the need for postoperative ICU stay is evaluated on an individual basis.[19] Patient treatment after the ICU stay is however based on tradition and no guidelines in the scientific community are established.

Certain aspects of neuromuscular scoliosis treatment are controversial, without scientific alignment, and have been so since the first spinal arthrodesis in 1911. This thesis aims to highlight several of these aspects. [20]

ABSTRAKT PRÆSENTATION

Der er afsat **fem minutter** til præsentationen
og **et minut** til spørgsmål fra salen

AFSTEMNING

Alle indsendte abstrakt indgår i foredragskonkurrencen
(bedste præsentation)

Den bedste præsentation 2024 kåres ved afstemning

Vinderen præsenteres umiddelbart efter afstemningen

FREE PAPER

Sessionsformand: Eva Posner

15:20 – 16:20

1: Smerter og føleforstyrrelser hos patienter med nerverodslæsioner verificeret med magnet resonans scanning.

Peter Andreas Andersen, læge, ph.d-studerende; Jan Rosner, læge, PD ; Mikkel Mylius Rasmussen, læge, ph.d.; Pushpa Raj Puri, læge; David Kocemba, læge, ph.d.-studerende; Hatice Tankisi, læge, klinisk professor, ph.d.; Nanna Brix Finnerup, læge, professor, dr.med.

2: Akut paraspinal kompartmentsyndrom – Case

Simone Dalskov, Reservelæge, Esben Lægsgaard, Reservelæge, Bjørn Borsøe Christensen, Afdelingslæge, ph.d., Thomas Bender, Overlæge, Kristian Høy, Overlæge, ph.d., klinisk lektor, Morten Aagaard Nielsen, 1. Reservelæge, ph.d., Kresten W. Rickers, Afdelingslæge, ph.d.

3: First-time continuous evaluation of intra- and postoperative cefuroxime target spine tissue concentrations in long-lasting spine deformity surgery (LLSDS) following repeated weight-dosed intravenous administrations.

Magnus A. Hvistendahl (MD-student), Mats Bue (MD, PhD), Pelle Hanberg (MD, PhD), Sara Kousgaard Tøstesen (MD), Sofus Vittrup (MD), Maiken Stilling (MD, PhD), Kristian Høy (MD, PhD)

4: Cervical Spine Injuries (CSI) and their Association to Blunt Cerebro-Vascular Injuries (BCVI): A Nationwide register-based cohort study.

Hanna Sissel Foldager Jeppesen., Lasse Kristensen., Ole Brink., Kristian Høy.

5: Title: Predictive Cervical Spine Fracture (CSF) Patterns for Blunt Cerebrovascular Injuries (BCVI): A Systematic Literature Review.

Hanna Sissel Foldager Jeppesen., Lasse Kristensen., Ole Brink., Kristian Høy.

6: The Modic change grading score is associated with outcome in lumbar stenosis surgery

P. Udby; O.N. Søren; L. Carreon, S. Dino

7: Glial fibrillary acidic protein as a potential diagnostic biomarker in traumatic spinal cord injury

Thea Overgaard Wichmann, MD, Helge Kasch, MD, PhD, DMSc, Stig Dyrskog, MD, PhD, Kristian Høy, MD, PhD Bjarne Kuno Møller, MD, Jan Krog, MD, PhD, Hans Jürgen Hoffmann, PhD, Claus Vinter Bødker Hviid, MD, PhD, Mikkel Mylius Rasmussen, MD, PhD

8: Does patients with multiple myeloma and vertebral compression fracture have slower recovery of pain than patients with osteoporosis and vertebral compression fracture?

Line A. Wickstrøm, Mikkel Ø. Andersen, Leah Carreon

9: Posterior migration of the mobile core in an unconstrained cervical disc replacement: A Case Report

Katerina Znacko, MD Anders Kruse, MD, Dennis Winge Hallager, MD, PhD

1: Smerter og føleforstyrrelser hos patienter med nerverodslæsioner verificeret med magnet resonans scanning

Peter Andreas Andersen, læge, ph.d-studerende; Jan Rosner, læge, PD; Mikkel Mylius Rasmussen, læge, ph.d.; Pushpa Raj Puri, læge; David Kocemba, læge, ph.d.-studerende; Hatice Tankisi, læge, klinisk professor, ph.d.; Nanna Brix Finnerup, læge, professor, dr.med.

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Hjerne- og Rygkirurgi, Aarhus Universitetshospital

Baggrund/formål: Korrekt identifikation af involveret nerverodssegment hos patienter kan være en klinisk udfordring hos patienter med usikre kliniske tegn på radikulopati. Smerteudbredelse i den påvirkede ekstremitet samt sensoriske forstyrrelser tolkes ud fra eksisterende dermatomkort som overvejende er baseret på studier publiceret i hhv. 1933 og 1948. På trods af dette har senere arbejder ikke underbygget de oprindelige dermatomkort som ikke i tilstrækkelig grad tager højde for overlap i forsyningsområder, forskydelser et segment op eller ned samt interindividuelle variationer. Vores hypotese er at en detaljeret sensorisk undersøgelse af patienter med nerverodstryk verificeret med magnet resonans (MR) scanning kan forbedre de eksisterende dermatomkort. Påvisning af sensoriske forstyrrelser i det smertefulde område taler for en neuropatisk smertekomponent.

Metode: Patienter med MR verificeret kompression af én eller to nerverødder inkluderes i et beskrivende tværsnitsstudie. Undersøger er blindet for afficeret nerverod og følgende sensoriske modaliteter undersøges: let berøring, varme, kulde, stik og krads. Udfald kategoriseres som "nedsat", "ophævet", "anderledes", "øget uden smerte", "øget med smerte" og markeres på patientens hud og fotodokumenteres. En undergruppe af patienter med reproducerbare udfald på armene undersøges yderligere med contact heat evoked potentials, cold evoked potentials og dermatomal somatosensory evoked potentials. Yderligere undersøges sensoriske udfald hos patienter med anlagt CT-vejledt nerverodsblokade.

Resultater: Foreløbige resultater fra 25 patienter viser at alle patienter rapporterede sensoriske forandringer i den smertefulde ekstremitet for mindst én af de testede modaliteter. Hyppigste modaliteter hvor der blev rapporteret udfald var varme, kulde og stik.

Diskussion: Anvendelse af yderligere sensoriske modaliteter i den neurologiske undersøgelse, særligt varme, kulde og stik, kan bidrage til at etablere nerverodstryk og taler for en neuropatisk smertekomponent hos patienter med MR-verificeret nerverodstryk.

2: Akut paraspinal kompartmentsyndrom – Case

Simone Dalskov, Reservelæge[1], Esben Lægsgaard, Reservelæge[2], Bjørn Borsøe Christensen, Afdelingslæge, ph.d.[2], Thomas Bender, Overlæge[1], Kristian Høy, Overlæge, ph.d., klinisk lektor[1], Morten Aagaard Nielsen, 1. Reservelæge, ph.d.[1,2], Kresten W. Rickers, Afdelingslæge, ph.d.[1]

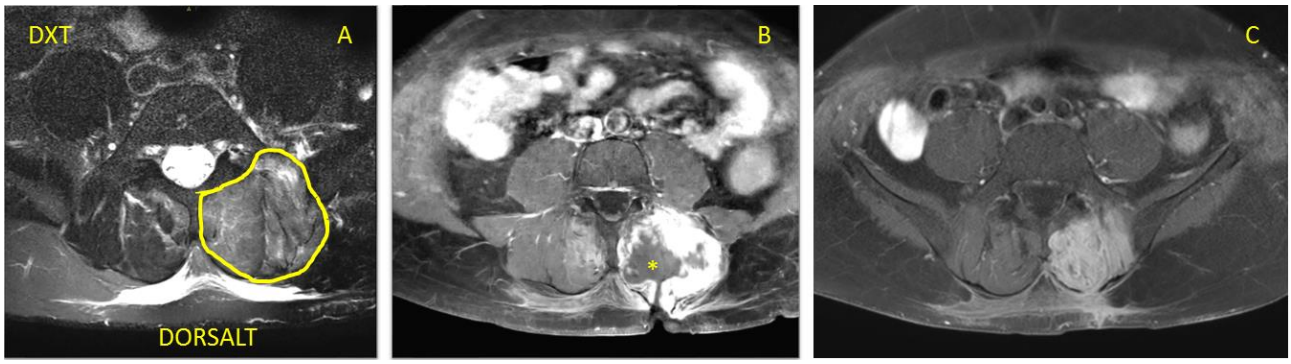
[1]Aarhus Universitetshospital, [2]Regionshospitalet Horsens

Akut kompartmentsyndrom i ekstremiteterne er en velbeskrevet tilstand, som ses i akutmodtagelser. Akut paraspinal kompartmentsyndrom er derimod en sjælden tilstand, som ikke tidligere er beskrevet i dansk kontekst.

Denne case omhandler en 49-årig mand, tidligere sund og rask, som blev indlagt på medicinsk akutafdeling med intraktable lændesmerter uden radikulopati, NRS 9-10. Smerterne var opstået fem timer efter endt styrketræning. Under træningen var der ingen traumer eller smerter. Arbejdsdiagnosen var DOMS. Trods 130 mg Morfin tbl., 37,5 mg Morfin IV, fast 30 mg Malfin x 2 samt Ibuprofen og Panodil var patienten fortsat ikke smertedækket til mobilisering. Biokemisk steg kreatinkinase fra 10.296 til 28.680 og myoglobin fra 1.642 til 4.756 over de to første indlæggelsesdøgn. CT-skanningen på 2. indlæggelsesdøgn var uden fund.
Efter ortopædkirurgisk tilsyn rejses mistanke om akut paraspinal kompartmentssyndrom og patienten overflyttes til højt specialiseret hospital. Præ-operativ MR-skanningen viste ødem i den paravertebrale muskulatur på venstre side. Patienten blev spaltet ca. 72 timer efter symptomdebut.
Patienten havde postoperativt eklatant færre smerter. Myoglobin faldt med 43% på 2. postoperative døgn. Patienten døjede i tre måneder postoperativt med sivning fra cikatrisen. Han er mobiliseret uden hjælpemidler og træner fortsat med fysioterapeut.

Manglende viden om dette tidskritiske syndrom, kan forsinke udredningen og behandlingen og derved risikere forringelse af outcome. Paraspinal kompartmentsyndrom er i internationale case reports hyppigst beskrevet hos mænd efter hård styrketræning. Andre årsager er traume og kirurgi. Klinisk manifesterer paraspinal kompartmentsyndrom sig med elementer som andre kompartmentsyndromer, både anamnestisk, objektivt og paraklinisk. På ekstremiteterne beskrives ofte et vindue for spaltning på 24-48 timer efter symptomdebut. Vi valgt at spalte efter 72 timer på smerteindikation og stigende myoglobin.

Litteraturen beskriver bedre funktionelt outcome 6 måneder postoperativt også ved forsinket spaltning.



Figur 1

De tre billeder viser MR-skanning i axiale snit på lumbalt niveau, henholdsvis præ-operativt (A), 6 uger post-operativt (B) og 3 måneder post-operativt (C). På billede A er den paraspinale muskulatur markeret i den gule cirkel. Der ses øget signal i muskulaturen på patientens venstre side, som tegn på ødem. Billede B og C er med kontrast, der ses øget optag på den afficerede side. Området markeret med * viser ikke tegn til optag af kontrast og vurderes derfor nekrotisk.

3: First-time continuous evaluation of intra- and postoperative cefuroxime target spine tissue concentrations in long-lasting spine deformity surgery (LLSDS) following repeated weight-dosed intravenous administrations.

Magnus A. Hvistendahl (MD-student), Mats Bue (MD, PhD), Pelle Hanberg (MD, PhD), Sara Kousgaard Tøstesen (MD), Sofus Vittrup (MD), Maiken Stilling (MD, PhD), Kristian Høy (MD, PhD)

Department of Clinical Medicine, Aarhus University, Palle Juul-Jensens Boulevard 99, Aarhus University Hospital, 8200 Aarhus N, Denmark; Department of Orthopaedic Surgery, Aarhus University Hospital, Palle Juul-Jensens Boulevard 99, Entrance J, 8200, Aarhus N, Denmark

Background: Antibiotic prophylaxis is central in preventing postoperative spine infections, yet knowledge of clinical spine tissue concentrations remains limited. Current antibiotic dosing regimens involve fixed doses based on empirical knowledge, non-clinical evidence (experimental models), plasma samples, and inferior methodology.

The aim was to continuously evaluate cefuroxime spine tissue concentrations in LLSDS after personalized antibiotic dosing (repeated weight-dosed intravenous administrations).

Method: Twenty patients scheduled for LLSDS with hypotensive anaesthesia were included; mean age (range): 17.5 (12-74), mean BMI (range): 22.2 (16.2-37.7), mean surgery time (range): 4h49min (3h57min-6h9min)).

All patients received weight-dosed cefuroxime (20 mg/kg) intravenously 25 min before incision and repeated after 4 hours. Microdialysis catheters were placed for sampling of cefuroxime concentrations in vertebral bone, paravertebral muscle, and subcutaneous tissue as soon as possible after surgery start. Upon wound closure, two catheters were placed in the profound and superficial part of the wound. Samples were obtained continuously up to 12 hours.

The primary endpoint was time with cefuroxime concentrations above the clinical breakpoint minimal inhibitory concentration for *Staphylococcus aureus* of 4 µg/mL in percentage (%*f*T>MIC4).

a) patients' individual surgery time,
b) first dosing interval (0-4 hours),
c) second dosing interval (4-12 hours).

Results: Mean cefuroxime %*f*T>MIC4 (range) of:

a) patients' individual surgery time was 100% (100-100%) in all investigated tissues.
b) the first dosing interval was 93% (93-93%) in vertebral bone, paravertebral muscle, subcutaneous tissue, and 99% (99-100%) in plasma.
c) the second dosing interval was between 87-94% (52-100%) in paravertebral muscle, subcutaneous tissue, the profound wound, the superficial wound, and 71% (42-100%) in plasma.

Conclusion: Personalized dosing (20 mg/kg) cefuroxime administrations provided homogenous and therapeutic spine tissue concentrations across all investigated tissues in LLSDS with hypotensive anaesthesia (up to 11 hours). Personalized dosing may decrease the risk of postoperative spine infections in the future.

4: Cervical Spine Injuries (CSI) and their Association to Blunt Cerebro-Vascular Injuries (BCVI): A Nationwide register-based cohort study.

Hanna Sissel Foldager Jeppesen.[1,2], Lasse Kristensen. [1,2], Ole Brink. [1,2], Kristian Høy. [1,2]

[1] Aarhus University, Denmark, Aarhus N, Denmark
[2] Aarhus University Hospital, Orthopedic Department, Traumatology and Spine Sections, Aarhus N, Denmark

Purpose: Neck and spine trauma are often presented in the Emergency Ward. Blunt cerebrovascular injuries (BCVI) are rare but carry high mortality and morbidity rates if undetected. The vast majority of BCVI remain clinically silent, but early detection and appropriate management of high-risk patients with BCVIs is crucial to prevent devastating neurological deficits such as posterior circulation stroke or death. We aim to determine predictors of BCVI in cervical spine injuries (CSI).

Methods:
A nationwide study in Denmark analyzed data from all four Level 1 traumacenters between 2017-22, identifying CSI and BCVI cases using Abbreviated Injury Scale (AIS). Factors including mean GCS, Injury Severity Score (ISS), age, and gender were explored. Univariate and multivariable logistic regression models were used. OR with 95% confidence intervals (CI) was computed together with means and standard deviation.

Results: Age or sex were not significant predictors of BCVI ($p = 0.12$ and $p = 0.65$; OR = 0.86; 95% CI, 0.44-1.66). The presence of any CSI ($p < 0.001$; OR = 26.3; 95% CI = 16.84-41.12) and cervical spine ligamentous injuries ($p = 0.0007$; OR = 5.4; 95% CI = 2.3-12.89) were strong predictive factors. An increase in ISS by one unit significantly correlated with BCVI ($p = 0.001$; OR = 1.03; 95% CI = 1.01-1.05). Fractures involving the atlanto-axial, odontoid, facet subluxations/dislocations and transverse foramen were not independent predictors of BCVI.

Conclusion: From a Danish cohort of patients admitted to a level 1 trauma center we found an incidence of BCVI of 3 per thousand. In case of verified injury to the cervical region the incidence rose to 6.25%. The study establishes a significant link between CSI and BCVI. Notably specific CSI patterns, particularly ligamentous injuries, hold predictive value for BCVI occurrence. Clinically recognizing these patterns are vital in identifying high-risk BCVI pat. Early detection protocols are crucial to prevent devastating neurological outcomes associated with undiagnosed BCVI. Tailored screening and management protocols are warranted to reduce BCVI-related complications post-trauma, potentially reducing severe neurological deficits and fatalities.

5: Predictive Cervical Spine Fracture (CSF) Patterns for Blunt Cerebrovascular Injuries (BCVI): A Systematic Literature Review

Hanna Sissel Foldager Jeppesen.[1,2], Lasse Kristensen. [1,2], Ole Brink. [1,2], Kristian Høy. [1,2]

[1] *Aarhus University, Denmark, Aarhus N, Denmark*
[2] *Aarhus University Hospital, Orthopedic Department, Traumatology and Spine Sections, Aarhus N, Denmark*

Purpose: Cervical spine fractures (CSF) are associated with blunt cerebrovascular injuries (BCVI) due to arterial proximity, impacting screening criteria. Undetected BCVI leads to high mortality (up to 40%) and morbidity (up to 80%). Motor vehicle accidents predominantly cause CSF, with reported BCVI incidence ranging from 30.4 - 78%. This literature review aims to identify CSF patterns predictive of BCVI, improving screening accuracy to prevent severe neurological deficits or fatalities.

Methods: A systematic review (SR) (2000-23) on PubMed, Embase with Prisma Guidelines was done to gather English articles addressing CSF patterns associated with BCVI (see Fig. 1).

Inclusion criteria adults (>16 years) with blunt cervical trauma and specific CSF patterns linked to BCVI. Exclusions was pediatric cases, penetrating traumas, unavailable full-text, and non-English articles. PRISMA guidelines, EpiBasic and STATA17 were used.

Results: Among 197 eligible articles, 8 met the criteria. Associated CSF patterns include isolated C1, C2, C3 fractures, any C1-C3, C4-C7 fractures, two-level fractures, subluxation/dislocations, occipital condyle (OC), and transverse foramen (TF) fractures. Pooled OR (95% CI) for BCVI and specific fractures: C1: 1.4 (0.99-2.1); C2: 1.2 (0.8-1.6); C3: 1.8 (0.9-3.6); C1-C3: 4.8 (2.9-7.99); C4-C7: 2.2 (1.4-3.4); TF: 5.7 (4.1-7.9); OC: 2.3 (1.0-5.0); Subluxation/dislocations: 1.4 (1.2-1.7); Two-level: 3.0 (1.9-4.7)

Conclusion: Our SR shows significant associations between BCVI and specific CSF patterns. Combined CSF C1-C3, C4-C7, OC type III, two-level, facet subluxations/dislocations, and TF fractures exhibit notable predictive value for BCVI. However, narrowing screening criteria solely to these high-risk patterns might potentially miss BCVI cases, leading to severe neurological complications. Balancing sensitivity and specificity in screening protocols remains crucial for effective BCVI detection and prevention of adverse neurological outcomes.

6: The Modic change grading score is associated with outcome in lumbar stenosis surgery

P. Udby[1]; O.N. Søren[2]; L. Carreon[3]; S. Dino[4]

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Introduction

Modic changes (MC) are a common phenotypic finding on MRI in patients with low back pain (LBP) and lumbar spinal stenosis (LSS). In patients with LBP and degenerative spine conditions undergoing surgery, MC have been associated with worse patient-reported outcomes (PROs). A clinically relevant MC grading type have been suggested by Modic et al. The purpose of the study is to investigate the impact of MC grade on PROs in patients undergoing LSS surgery

Materials and Methods

Patients from the Danish national spine registry, DaneSpine, scheduled for LSS surgery were identified. Lumbar MRI of patients with preoperative MC was selected for inclusion. MC was defined and graded according to the Udby and Modic et al. classification. In addition, preoperative and two-year postoperative data were collected including demographics (age, BMI, smoking etc.) and PROs consisting of pain scores - Visual Analogue Scale for back pain (VAS-BP) and leg pain (VAS-LP); and physical disability score - Oswestry Disability Index (ODI).

Results

In total, n=208 patients were included, 15% (31 pts) with MC grade A and 85% (177 pts) with MC grade ≥B. There was no significant difference in preoperative age, BMI or smoking between the two groups - 68 vs. 67 years (p=0.746); 27 vs. 28 kg/m2 (p=0.370); 19% vs 18% smokers (p=0.546). There was no significant difference in preoperative pain or disability scores, VAS-back (VAS-BP) or leg pain (VAS-LP) and Oswestry Disability Index (ODI), p>0.1. At two-year follow-up after LSS surgery, patients with MC grade ≥B had significantly worse pain scores, VAS-BP - 32 vs. 44 (p=0.045) and VAS-LP - 27 vs. 45 (p=0.003). Physical disability was significantly worse at two-year follow-up in the MC grade ≥B group, ODI score - 22 vs. 30 (p=0.036).

Conclusion

This is the "first study" to evaluate the association between the MC grading score and PROs in patients undergoing LSS surgery. MC grade ≥B was associated with significantly worse pain scores and increased disability at two-year follow-up.

We suggest, that future studies include the MC grading score in order to investigate the possible impact of MC phenotypes on PROs.

7: Glial fibrillary acidic protein as a potential diagnostic biomarker in traumatic spinal cord injury

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Background: Extensive research into the field of biochemical biomarkers has been conducted striving to improve diagnostics and prognostics of traumatic spinal cord injury (TSCI). Biomarkers have been measured in cerebrospinal fluid (CSF) and peripheral blood (PB); however, PB is the most applicable sample media due to its accessibility. It remains to be clarified which sample media that is ideal to measure biomarkers, and which proteins that are most suitable as biomarkers. This study aims to compare concentrations of biomarkers in CSF and PB, and to investigate associations between biomarker concentrations and injury severity i.e., American Spinal Injury Association (ASIA) Impairment Scale (AIS) grade, and biomarker concentrations and clinical outcome i.e., AIS grade improvement and Spinal Cord Independent Measure version III (SCIM-III) score.

Methods: A prospective study of TSCI patients (n=15) and healthy controls (n=15) was conducted. Sample collection and outcome assessment were performed at median 13 hours [IQR: 19], 9 days [IQR: 2] and 148 days [IQR: 49] after injury. Concentrations of neuron-specific enolase (NSE), glial fibrillary acid protein (GFAP), neurofilament light chain (NfL), interferon-γ (IFN-γ), interleukin (IL)-1ß, IL-2, IL-4, IL-6, IL-8, IL-10, IL-12p70, IL-13, tumor necrosis factor α (TNF-α) were measured and associated to outcome.

Results: Biomarker concentrations were higher in CSF than PB. CSF concentrations of GFAP (p=0.024), NSE (p=0.035), IFN-γ (p=0.009), TNF-a (p=0.032), IL-2 (p=0.034), IL-12p70 (p=0.028), IL-4 (p=0.027), IL-10 (p=0.018), and IL-13 (p=0.032), and PB concentrations of GFAP (p=0.030) and IFN-γ (p=0.026) were significantly associated with injury severity i.e. AIS grade, but not with AIS grade improvement or SCIM-III score.

Conclusions: The results cannot point out the ideal sample media for biomarker research; however, CSF and PB should be applied in future research as the ideal sample media might depend on the biomarker of interest. Yet, the results suggest GFAP as a potential diagnostic biomarker.

8: Does patients with multiple myeloma and vertebral compression fracture have slower recovery of pain than patients with osteoporosis and vertebral compression fracture?

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Background and objective: Multiple myeloma (MM) is a plasma cell cancer. It is associated with increased bone breakdown and inhibited regeneration of new bone, leading to a high risk of vertebral compression fracture (VCF).

Patients with osteoporosis are also in risk of having VCF, but the bone regeneration is not affected in osteoporotic patients. One might therefore hypothesize that patients with MM experience protracted healing due to inhibition of new bone formation.

Thus, our objective investigate differences in pain scores in patients with MM and osteoporosis with VCF.

Methods: The patients consisted of two groups followed in two RCTs investigating the effect of vertebral augmentation in patients with MM and patients with osteoporosis, respectively. All patients had non-surgical treatment, and Visual Analogue Score (VAS) back pain were measured at inclusion and in week 1-4 after inclusion.

Results: The MM group (22 patients) had no statistical significant improvement in VAS from inclusion to week 1 ($p = 0.11$), but a significant improvement was observed in week 2, 3 and 4 ($p = 0,04$, $p = 0,04$, $p = 0,03$). The osteoporosis group (24 patients) had a significant improvement in VAS from inclusion to all 4 time points ($p < 0.0001$).

When comparing the MM and osteoporosis group there were no difference between the groups at baseline ($p = 0,30$). The decrease in VAS back pain relative to baseline was significantly higher in the osteoporosis group than in the MM group in week 1-4 ($p = 0,0035$, $p = 0,0017$, $p < 0,0001$, $p < 0,0001$).

Conslusion: Patients with MM and osteoporosis and VCF experience pain relief in a period of 4 weeks. However, patients with MM improve to a lower extend within the period compared with patients with osteoporosis.

9: Posterior migration of the mobile core in an unconstrained cervical disc replacement:
A Case Report

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Introduction: Cervical disc replacement (CDR) offers motion preservation compared to fusion for degenerative disc disease. We report a rare case of posterior migration of a mobile core in an unconstrained device, highlighting the risk of potential devastating complications following disc replacement surgery.

Case Presentation: In 2016 a then 29-year-old woman had a Mobi-C arthroplasty at C5/6 for a disc herniation, that did not improve with 6 months of conservative management. Postoperatively, symptoms improved. In 2024 the now 38-year-old woman was referred for surgical evaluation following two months of recurrent pain in the neck and right arm alongside difficulty in neck flexion. Imaging revealed cervical kyphosis, displacement of the upper metal endplate and posterior migration of the polyethylene core, which occupied the right side of the spinal canal.

Management and Outcome: Revision surgery revealed a loose upper metal endplate with soft tissue metallosis and a posterior-migrated core with the right anterior corner worn away. The device was removed followed by debridement and fusion surgery at the level. The patient's symptoms resolved postoperatively; however, soft tissue and device sonication cultures were positive for Cutibacterium acnes. Advised by microbiologists, the patient was treated with 2 weeks of intravenous followed by 6 weeks of oral penicillin. The patient is awaiting a 3-month follow up visit in our outpatient clinic.

Discussion: This case underscores the complexities of CDR surgery, emphasising the importance of further research into device failure mechanisms. We are aware of two other cases of posterior core migrations from literature. In this case, the loosened upper endplate could have contributed to increased motion and thus wear of the core making it susceptible to migration.

Conclusion: Although CDR device disintegration is a rare complication, the potentially devastating risk has to be weighed against the expected benefits over traditional fusion surgery.

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