PROGRAM

ÅRSMØDE
&
25-ÅRSJUBILÆUM

OSTEOPOROSE OG RYGKIRURGI

Dansk Rygkirurgisk Selskab

2. OG 3. JUNI 2023
KOLDING FJORD

DRKS 2023

DANSK RYGKIRURGISK SELSKABS ÅRSMØDE
25-ÅRSJUBILÆUM
2.- 3. JUNI 2023, KOLDING, DANMARK

SØLV SPONSORER

BRONZE SPONSORER

VELKOMMEN

Kære medlemmer og gæster.

Vi byder jer alle velkommen til Dansk Rygkirurgisk Selskabs årsmøde 2023, som samtidig er selskabets 25-årsjubilæum. Det har vi valgt at markere med et årsmøde over to dage, og et skift af lokalisation til Hotel Koldingfjord med det formål at kunne favne det udvidede årsmødes program.

Selskabet er i disse år i forandring, med et generationsskifte i det rygkirurgiske felt. De der grundlagde selskabet er på vej mod karrierens efterår, og en sådan brydningstid vil altid være en test for et relativt ungt fagligt fællesskab. Heldigvis er der noget at fejre. Dansk rygkirurgisk selskab ser ud til at trives. Vi oplever i disse år medlemsfremgang, de sidste to år på 15%, og er nu på 100+ medlemmer. Vi ser med andre ord ud til at have bestået testen.

Hotel Koldingfjords oprindelige navn var "Julemærkesanatoriet". Det var postmester Einar Holbøll, der fik ideen til at sælge julemærker. Ideen gik ud på, at alle, rig som fattig, skulle være med til at hjælpe svage og syge børn. Når folk sendte julekort til hinanden, gav de 2 øre ekstra for et julemærke, som blev klistret på ved siden af frimærket. På den måde var de med til at finansiere byggeriet af flere sanatorier. Hotel Koldingfjord var det første julemærkesanatorium, som blev opført i Danmark.

Fra 1911 til 1960 fungerede bygningerne som sanatorium for børn ramt af tuberkulose, og blev dermed en vigtig brik i kampen mod den frygtede folkesygdom. I dag er sanatoriet blevet restaureret og anvendes til restauration, hotel og konferencecenter.

En historisk sundhedsinstitution der med denne fortid er en særligt passende ramme om Dansk Rygkirurgisk Selskabs Årsmøde 2023.

Programmet i år spænder vidt og dækker de fleste rygkirurgiske discipliner. Der er et rekordhøjt antal abstracts, inviterede gæstetalere i en særskilt session men også efterladt plads til faglige diskussioner.

Vi byder jer alle velkommen til Kolding, og ser frem til et godt årsmøde!

På vegne af planlægningsgruppen i Dansk Rygkirurgisk Selskab

Mikkel Mylius Rasmussen

Formand for Dansk Rygkirurgisk Selskab

INDHOLD

GENEREL INFORMATION

HOTEL

Værelserne er løbende klar fra kl. 13:00 og inden kl. 15:00 fredag den 2. juni

Check ud senest kl. 8:30 lørdag den 3. juni

Enhver brug af minibaren eller andet mod betaling, skal afregnes særskilt i hotellets reception ved afrejse

MÅLTIDER

Morgenbuffet for overnattende gæster serveres i hotellets restaurant
fra kl. 6:30 – 10:00

Frokost fredag: Kl. 11:50 til 12:50 serveres i hotellets restaurant

Frokost lørdag: Kl. 12:00 Lunch bag ”to go” i foyeren

Alle kaffepauser afholdes i udstillingsområdet i Magnoliesalen.
Tidspunkter fremgår af dagsprogram

KONFERENCEMIDDAG FREDAG

(for tilmeldte)

Kl. 18:30 byder DRKS velkommen i hotellets restauranten
herefter serveres konferencemiddagen

FORMÆND OG BESTYRELSER I DANSK RYGKIRURGISK SELSKAB

	Formand:	Bestyrelse:
1998 - 2003:	Søren Fruensgaard	Thomas Kjær, Peter Duel, Anders Kruse
2003 - 2005:	Anders Kruse	Thomas Kjær, Søren Fruensgaard, Peter Duel
2005 - 2006:	Karsten Thomsen	S.E. Børgesen, Rene Tyranski og Benny Dahl.
2006 - 2008:	Christian Møller	S.E. Børgesen, Martin Gehrchen,
2012 – 2014:	Michael Albæk	Ukendt, ukendt, ukendt
2014 - 2015:	Martin Gehrchen	Ukendt, ukendt, ukendt
2015 - 2017:	Dorte Clemmensen	Rachid Bech-Azeddine, Mikkel Ø Andersen, Jon Kaspersen
2017 - 2021:	Michael Nielsen	Rachid Bech-Azeddine, Mikkel Ø Andersen, Jon Kaspersen / Mikkel Mylius Rasmussen
2021 - :	Mikkel Mylius Rasmussen	Rachid Bech-Azeddine/Viola Olesen, Mikkel Ø Andersen, Michael Nielsen/Alexander Isenberg-Jørgensen.

PROGRAM FREDAG DEN 2. JUNI

08:30 - 09:25 Kaffe og brød / udstilling (Magnoliesalen)

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

09:30 - 10:15 Præsentation af danske rygkirurgiske ph.d. afhandlinger 2022
Sessionsformand: Michael Nielsen

- Andreas Kiilerich Andresen, Rygcenter Syddanmark, Sygehus Lillebælt "**Instrumented versus Uninstrumented Fusion in Degenerative spondylolisthesis"**

- Casper Friis Pedersen, Rygcenter Syddanmark, Sygehus Lillebælt **”Decision Support in Spine Treatment Guided by Machine Learning and Registry Data”**

- Sanjay Sagar, Rigshospitalet, afs. Glostup. **”Molecular biology in the pain generation in lumbar intervertebral discs”**

10:15 - 10:40 Skoliosesession (foredragskonkurrence).
Sessionsformand: Benny Dahl

10:40 - 10:55 Kaffe / udstilling (Magnoliesalen)

10:55 - 11:50 Generalforsamling (kun for medlemmer)

11:50 - 12:50 Frokost

PROGRAM FREDAG DEN 2. JUNI

Theme – "Osteoporotic spine surgery"

12:50 - 12:55	Introduction: Mikkel Mylius Rasmussen
12:55 - 13:15	*"Osteoporosis and its impact on the spine – the view of an Endocrinologist"* Professor Bente Langdahl, Department of Endocrinology, Aarhus University Hospital
13:15 - 13:45	"*PVP and kyphoplasty treatment for osteoporotic fractures: Indications and cautions"* Professor Marc Antoine Rousseau, Chirurgie Orthopédique et Traumatologique Bichat - Beaujon Paris, France
13:45 - 14:00	"*Challenges in spine surgery on the osteoporotic patient"* Professor Benny Dahl, Spine Unit. Rigshospitalet
14:00 - 14:15	Panel discussion on the topic: Optimal treatment choice in the ostheoporotic patient
14:15 - 14:30	Kaffe / udstilling (Magnoliesalen)
14:30 - 15:00	Traumer og misdannelser (foredragskonkurrence). Sessionsformand: Rachid Bech-Azaddine
15:00 - 15:10	Oplæg om et nationalt forskningsnetværk Mikkel Østerheden Andersen
15:10 - 16:30	Degenerativ ryg (foredragskonkurrence). Sessionsformand: Louise Møller Jørgensen

PROGRAM LØRDAG DEN 3. JUNI

08:30 - 09:30	Kaffe / udstilling - Magnoliesalen
09:30 - 10:00	”Tiden efter Operation X” - Mikkel Mylius Rasmussen
10:00 - 10:15	Kaffe / udstilling - Magnoliesalen
10:15 - 11:55	Nationalt forskningsnetværk: Brainstorm og netværk
11:55 - 12:00	Afrunding af DRKS årsmøde 2023
12:00	Lunch bag ”to go” i foyeren

DANSKE RYGKIRURGISKE PH.D. AFHANDLINGER 2022

Sessionsformand: Michael Nielsen

09:30 - 10:15

Andreas Kiilerich Andresen

Rygcenter Syddanmark, Sygehus Lillebælt

"Instrumented versus Uninstrumented Fusion in Degenerative spondylolisthesis"

Casper Friis Pedersen

Rygcenter Syddanmark, Sygehus Lillebælt.

"Decision Support in Spine Treatment Guided by Machine Learning and Registry Data"

Sanjay Sagar

Rigshospitalet, afs. Glostup.

"Molecular biology in the pain generation in lumbar intervertebral discs"

Andreas Kiilerich Andresen, Rygcenter Syddanmark, Sygehus Lillbælt

"Instrumented versus Uninstrumented Fusion in Degenerative spondylolisthesis"

Due to inconsistencies in the literature, and no clear guidelines for lumbar fusion in the elderly, this PhD study aimed to investigated the outcome and cost effectiveness of added instrumentation in lumbar spinal fusion in the elderly, when treating degenerative spondylolisthesis. Further, we aimed to investigate the importance of a preoperative sagittal imbalance in one-level in-situ fusion, regardless of fusion method.

A randomized controlled trial was performed, 108 were included and by randomization divided into two groups. Group 1 underwent standard midline sparing decompression and uninstrumented fusion, with allograft mixed with local autograft from the decompression, due to degenerative spondylolisthesis and spinal stenosis. Group 2 underwent the same standard midline sparing decompression, and in addition to the bone graft, pedicle screw instrumentation was performed at the index level.

At surgery, patients answered a standard battery of questionnaire, including Oswestry Disability Index, EuroQoL-5D-3L, VAS-back and -leg, Zurich Claudication Questionnaire and ShortForm36. A lateral 36" X-ray was taken before surgery, to measures preoperative sagittal balance.

Patients were followed for two years after surgery, with patient reported outcomes and 36" X-rays at one- and two-year follow-up. At one-year follow up, a CT-scan was performed to investigate fusion status.

We found no difference in disability, quality of life or pain at one- and two- year follow up. There wwasere a marked difference in fusion rates in favor of the instrumented fusion (94% vs 31%)

Seven patients underwent reoperation in the uninstrumented group versus one patient in the instrumented group, at two-year follow up.

Alongside the randomized trial, a micro-adjusted economical evaluation was performed. The accumulated costs were based on a journal audit, and generation of costs were done from a bottom-up perspective. With a moderate increase in quality adjusted life years in the instrumented group of 0.095, and an increased cost of 146.2, we found an incremental cost effectiveness ratio of €1536.2, suggesting that instrumented fusion was cost-effective. When performing sensitivity analysis based on all reoperations or based on standard hospital reimbursement rates, instrumented fusion dominated uninstrumented fusion with better outcome and lower costs, suggesting a moderate cost saving with instrumentation.

When investigating the effect of a preoperative sagittal imbalance, we found a correlation between preoperative sagittal vertical axis and preoperative patient reported outcomes, but there were no correlations to sagittal vertical axis and outcome at either one- or two-year follow up.

In conclusion, we found that, although there were no statistically significant differences between groups based on patient reported outcomes, patients in the instrumented group had fewer reoperations and a higher fusion rate compared to the uninstrumented group. The cost analysis suggest that instrumented fusion is cost effective with an ICER of 1536.2. Concluding that, in treating degenerative spondylolisthesis in the elderly, instrumented fusion would be advisable in patients where fusion is needed.

Casper Friis Pedersen, Rygcenter Syddanmark, Sygehus Lillbælt.

"Decision Support in Spine Treatment Guided by Machine Learning and Registry Data"

Lumbar spinal stenosis is an abnormal narrowing of the spinal canal that causes impingement of the nerves traveling through the lower back into the legs. Symptoms may include pain, weakness or numbness in legs, calves, or buttocks. Walking, standing, and extending the lower back can aggravate symptoms. Lumbar spinal stenosis is a frequent age-related spinal disorder with an estimated prevalence of 20-50% among the geriatric segment of the population and is the leading cause of spinal surgery among the elderly. According to the Danish national spine registry DaneSpine, 3/4 of patients can expect considerable pain relief 1 year after surgery and 2/3 will experience improvements in quality of life. About 1/4 - 1/3 of patients do not feel a clear improvement.

The variation in surgical outcome often makes it difficult to communicate a reliable prognosis to the patient. The main purpose of this thesis was to establish if reliable individualized estimates of outcome could be computed preoperatively through predictive algorithms modelled on existing registry data.

In study 1, we found that the predictive performance of the Swedish decision support Dialogue Support did not generalize well to Danish patient samples. While AUC values were comparable with the results reported by the authors of the Dialogue Support, both calibration plots and performance metrics revealed a low ability to correctly identify unfavourable outcomes (true negatives).

In study 2, seven different machine learning algorithms were applied to Danish spine data. On average, they performed nearly equally well but variation was found across outcome measures. The EQ-5D and VAS back models performed almost equally well, while the ODI and VAS leg models were less convincing. VAS leg and return to work models exhibited the largest differences in performance between algorithms. MARS and deep learning performed consistently well.

In study 3, non-operated LSS patients were matched with operated patients to ensure equivalent baseline characteristics. Both groups were diagnosed with MRI-confirmed LSS by spine surgeons. The outcome was compared at 1 year following their initial consultation with a spine surgeon. Although both groups improved on average, differences were in favour of the operated patients whether measured as mean improvement or proportions reaching a minimal clinical important difference. Less than half of the non-operated achieved MCID on EQ-5D, VAS back/legs compared to 2/3 of the operated.

Sanjay Sagar, Rigshospitalet, afs. Glostup.

"Molecular biology in the pain generation in lumbar intervertebral discs"

Low back pain (LBP) refers to pain and stiffness of the lower portion of the back; the primary cause of disability globally. About 85-90% of patients are diagnosed with essential LBP, with no documented course behind the pathology. LBP is associated with degeneration of the intervertebral disc (IVD) (visualized using magnetic resonance imaging), and lumbar spinal fusion of the degenerated level may alleviate pain for the patient. However, the patients present heterogenicity in chronic back pain intensity, treatment outcome, and prognosis. We hypothesize that LBP has a vital inflammatory component and that inflammatory mediators such as TNF-α, IL-1, and IL-6 are expressed in the annulus fibrosus and nucleus pulposus in a higher concentration in patients relative to their grading of pain intensity and disability. Furthermore, the degeneration is also associated with dysregulation of extracellular matrix synthesis due to increased expression of matrix cleaving proteases, such as matrix metalloproteinases (MMPs) and A Disintegrin and Metalloproteinase with Trombospondin motifs (ADAMTSs). Cytokines have also been shown to upregulate the expression of these proteases. Similarly, Transient Receptor Potential (TRP) ion channels also emerged as receptors for inflammatory molecules involved in the processing of inflammatory mediated pain. Previous studies have shown dysregulation of TRP ion channels in IVD and other joint diseases.

The aim of this thesis is (I) to evaluate the association of inflammatory mediators with low back pain, (II) to examine the association of several MMPs and ADAMTSs subtypes in IVD with degeneration and (III) to investigate the expression of TRP ion channels in IVD and its association with inflammatory mediated pain.

We studied the expression of TNF-α, IL-1β, and IL-6 in IVD biopsies from 34 patients and found a highly statistically significant positive correlation between pain intensity (Visual Analog Scale score) and disability (Oswestry Disability Index (ODI) score) with the expression of cytokines. We further studied the role of different metalloproteinases in the lumbar discs because the loss of extracellular matrix is observed in degenerative disc disease (DDD). We studied the expression of different metalloproteinases and correlated them to the Pfirrmann magnetic resonance imaging classification system (grade I-V) of lumbar DDD. We found a highly significant positive correlation between Pfirrmann grades and the gene expression of several metalloproteinases like MMP-1, ADAMTS-1&5. A post hoc statistical analysis (uncorrected p-values) also demonstrated a positive correlation between the expression of TNF-α, IL-6, and ADAMTSs/MMPs and the Pfirrmann grades. These findings show that disc degradation in DDD is strongly associated with the expression of some metalloproteinases. We further studied the role of TRP ion channels that have recently emerged as contributors to disc pathology and plays an important role in pain processing. Hence, the purpose of our overall study was to determine the expression of different TRP ion channel subtypes (TRPV1, TRPV4, TRPC6, TRPM2 and TRPM8) in IVD biopsies from patients with chronic low back pain. We found a statistically significant positive correlation between pain intensity and expression of TRPV1, TRPC6, TRPM2, TRPM8 in the annulus fibrosus. Moreover, we showed a significant positive correlation between disability score (ODI) and expression of both TRPV1 and TRPM8. Interestingly, postoperative follow-up of treatment response after 12-months demonstrated a significant positive correlation between TRPV1 expression at baseline and the follow-up ODI score, which might be a potential marker for predicting the effect of surgery. Overall, our results suggest the association between TRP ion channels expression and chronic low back pain.

The present PhD thesis creates a basis for future research on other cytokines, proteases and TRP ion channels. Our studies help to characterize biomarkers of DDD that may serve as potential predictors of treatment response in the future. However, broad multi-tiered design approaches are necessary to develop effective therapies and interventions to delay the onset of disc degeneration and prevent associated chronic low back pain.

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 2023 kåres ved afstemning.

Der stemmes individuelt efter hver fremlæggelse på
stemmeseddel i salen.

Vinderen præsenteres til festmiddagen om aftenen.

SKOLIOSESSION

Sessionsformand: Benny Dahl

10:15 – 10:40

01: The magnetic field strength and the force distance dependency of the magnetically controlled growing rods used for early-onset scoliosis

*Lars Diekhöner M.Sc. PhD, **Charlotte Sommer Meyer** , Kresten Wendell Rickers MD, PhD, MD, Søren Peter Eiskjær MD*

02: The effect of night-time bracing on the sagittal profile in adolescent idiopathic scoliosis

***Martin Heegaard**, Niklas Tøndevold, Benny Dahl, Thomas B Andersen, Martin Gehrchen, Søren Ohrt-Nissen*

03: Revision surgery in Adult Spinal Deformity (ASD): A 2-year comparison between Lumbar Pedicle Subtraction Osteotomy (PSO) and supplemental Posterior Lumbar Interbody Fusion (PLIF)

***Lærke C. Ragborg,** Niklas Tøndevold, Ture Karbo, Robert Svardal-Stelmer, Lars Valentin, Benny Dahl, Martin Gehrchen*

01: The magnetic field strength and the force distance dependency of the magnetically controlled growing rods used for early-onset scoliosis.

*Lars Diekhöner[1] M.Sc. PhD, **Charlotte Sommer Meyer[2,3]** , Kresten Wendell Rickers MD, PhD[2,3], MD, Søren Peter Eiskjær[2,3] MD*

[1]Aalborg University, Physics Group, Department of Materials and Production, Skjernvej 4A, 9220 Aalborg Ø, Denmark.
[2]Department of Orthopedic Surgery, Aalborg University Hospital, Hobrovej 18-22, 9000 Aalborg C, Denmark.
[3]Department of Clinical Medicine, Faculty of Medicine, Søndre Skovvej 15, 9000 Aalborg C, Denmark.

Background: Untreated early-onset scoliosis (EOS) leads to respiratory insufficiency and reduced life expectancy. Magnetically controlled growing rods (MCGR's) have revolutionized the treatment of EOS. It is now possible to do painless lengthening in the outpatient clinic without anesthesia. However, MCGR's have inherent complications like non-functioning of the lengthening mechanism. We aimed to specify one correct indication for MCGR use by measuring the lengthening forces at varying distances between the external remote controller (ECR) and the MCGR to quantify the role of implantation depth.

Materials and method: The magnetic field strength was measured on new and explanted rods, at different distances between the external remote controller and the MCGR and likewise in patients before and after distractions in the outpatient clinic. All rods were from the MAGEC system (Nuvasive Inc., US). Two new and 12 explanted MCGRs was used for the lab measurements of the elicited force using a forcemeter. At the outpatient clinic we measured on four patients, each with two implanted rods.

Results: At a distance of 25 mm, the force was reduced to approximately 40% (ca. 100 N) compared to zero distance (ca. 250 N), most so for explanted rods. The magnetic field strength of the internal actuator decayed fast with increasing distances and plateaued at 25–30 mm approximating zero.

Conclusion: Based on our findings, it is of outmost importance minimizing the implantation depth to ensure proper functionality of the rod lengthening. Therefore, we recommend a distance of 25 mm from skin to MCGR to be considered a relative contraindication to clinical use in EOS patients.

02: The effect of night-time bracing on the sagittal profile in adolescent idiopathic scoliosis.

***Martin Heegaard*[1]**, *Niklas Tøndevold, Benny Dahl, Thomas B Andersen, Martin Gehrchen, Søren Ohrt-Nissen*

[1] *Spine Unit, Department of Orthopedic Surgery, Rigshospitalet, Copenhagen University Hospital, Inge Lehmanns Vej 6, 2100 Copenhagen, Denmark*

Background & Aim: Adolescent idiopathic scoliosis (AIS) characterized by a coronal scoliosis and often a sagittal hypokyphosis. The effect of bracing on the sagittal profile is not well understood. The aim of this study is to assess the effect of night-time bracing on the sagittal profile in patients with AIS.

Methods: We retrospectively included AIS patients with a main curve of 25-45° treated with a night-time brace in our institution between 2005 and 2018. Patients with an estimated growth potential irrespective of Risser stage and menarchal status were included. Coronal and sagittal radiographic parameters were recorded at brace initiation and post bracing using the classification described by Abelin-Genevois for sagittal parameters and Lenke for the coronal deformity. Patients were followed until surgery or one year after brace termination.

Results: One hundred forty-six patients were included. Maximum thoracic kyphosis (TK) increased by a mean of 2.5° (±9.7) (p=0.003). Twenty-seven percent (n=36) of the patients were hypokyphotic (T4/T12 <20°) at brace initiation compared with 19% (n=26) at brace termination (p=0.134). All other sagittal parameters remained the same at follow-up. We found no association between progression in the coronal plan and change in sagittal parameters.

Conclusion: This is the first study to indicate that night-time bracing of AIS does not induce hypokyphosis. We found a small increase in TK during bracing but 20% still remained hypokyphotic. The coronal curve progression was not coupled to change in TK.

03: Revision surgery in Adult Spinal Deformity (ASD): A 2-year comparison between Lumbar Pedicle Subtraction Osteotomy (PSO) and supplemental Posterior Lumbar Interbody Fusion (PLIF)

Lærke C. Ragborg, *Niklas Tøndevold, Ture Karbo, Robert Svardal-Stelmer, Lars Valentin, Benny Dahl, Martin Gehrchen*

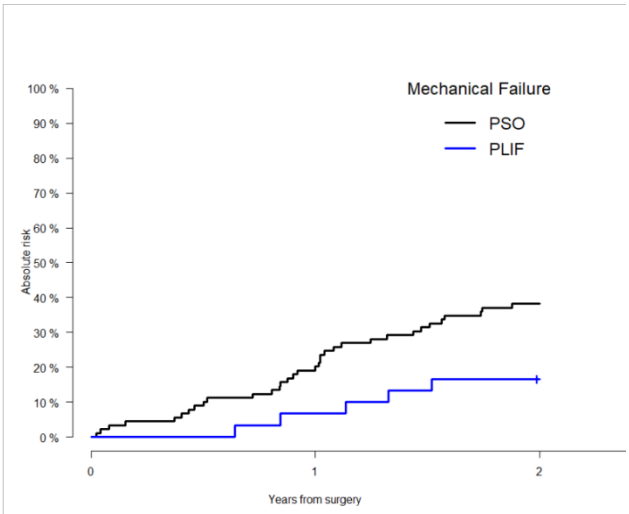
[1] *Spine Unit, Dept. Of Orthopedic Surgery, Rigshospitalet, Copenhagen, Denmark*

Background and aim High revision rates remain a concern when treating patients with ASD. PSO is the golden standard when treating rigid deformities; however, it is associated with high postoperative complications, including mechanical failure. The PLIF technique is thought to facilitate the restoration of the lordosis and subsequently sagittal alignment and improve intercorporal bony fusion.

The main purpose of this study was to compare revision rates and sagittal correction in patients with ASD treated with either PSO or PLIF without PSO.

Methods In 2016, PLIF was introduced at our institution as an alternative method to creating lordosis, as opposed to only having been using PSO during the previous years. We, therefore, analyzed two cohorts of patients with ASD undergoing either: PSO in 2010-2015 or PLIF in 2016-2020, retrospectively. None of the patients received both treatments during the period. ASD was defined as posterior fusion of ≥5 levels including sacrum. The rate of mechanical failure was obtained and analyzed using competing risk analysis. Full-spine radiographs were analyzed and compared between cohorts.

Results We included 119 patients (89 PSO and 30 PLIF) with a mean age of 64.1±10 years. Baseline demographics and radiographic parameters were comparable between cohorts except for SVA; 115±28 mm vs 87±46 mm (p-value<0.05) and segmental lordosis; 5.0±17° vs 14±3° (p-value<0.05) for PSO and PLIF, respectively. Competing risk analysis showed a cumulative incidence of revision surgery of 38.2% (95% CI 28.1-48.3) vs 16.7 (95% CI 3.3-30.0) (p-value = <0.05) for PSO and PLIF at 2-year follow-up. We found an increased odds ratio for revision surgery when treated with PSO of 2.77 (95% CI 1.10-6.69) (p-value <0.05) after adjusting for preoperative SVA and segmental lordosis. A comparable sagittal alignment was obtained for both groups postoperatively.



Conclusion A substantially lower revision rate was seen for patients undergoing PLIF compared with PSO at a 2-year follow-up. Moreover, an increased odds ratio for revision was found for PSO patients. A satisfactory sagittal correction was obtained for both groups regardless of the procedure. Thus PLIF should be considered when technically possible.

TRAUMER OG MISDANNELSER

Sessionsformand: Rachid Bech-Azaddine

14:30 – 15:00

04: Fluorescein-guided surgical ablation of Spinal Dural Arteriovenous Fistula (SDAVF) is safe and leads to clinical- and imaging improvement

Entezari S*, Thygesen MM, Gudmundsdottir G, Carlsen JG, Mikkelsen R, Rasmussen MM*

05: Traumatic atlantoaxial rotatory subluxation - report of 4 cases

Haisheng Li, *Phd, overlæge, ortopædkirurgisk afdeling, Aarhus universitetshospital.*

06: Traumatic spinal cord injury is correlated to increased risk of autoimmune/-inflammatory disease

Tim Damgaard Nielsen*, Thomas Munk Laursen, Bodil Hammer Bech, Mikkel Mylius Rasmussen*

07: A traumatic spinal cord injury critical care porcine model

Mathias Møller Thygesen *Seyar Entezari, Nanna Houlind, Teresa Haugaard Nielsen, Nicholas Østergaard Olesen, Tim Damgaard Nielsen, Mathias Skov, Alp Tankisi, Mads Rasmussen, Halldór Bjarki Einarsson, Peter Agger, Dariusz Orlowski, Stig Eric Dyrskog, Line Thorup, Michael Pedersen, Mikkel Mylius Rasmussen*

08: Rate of unexpected malignancy in patients with vertebral compression fracture undergoing percutaneous vertebroplasty – six years after implementation of a new magnetic resonance imaging scanning protocol

Line A. Wickstrøm*, Søren R. Rafaelsen, Mikkel Ø. Andersen, Andreas D. K. Andresen, Signe F. Elmose, Leah Carreon*

04: Fluorescein-guided surgical ablation of Spinal Dural Arteriovenous Fistula (SDAVF) is safe and leads to clinical- and imaging improvement

Entezari S[1,2], *Thygesen MM[1,2], Gudmundsdottir G[1], Carlsen JG[1], Mikkelsen R[3], Rasmussen MM[1,2]*

[1]Department of Neurosurgery, Aarhus University Hospital, Aarhus N, Denmark
[2]Cense-Spine
[3]Department of Neuroradiology, Aarhus University Hospital, Aarhus N, Denmark

Background: Spinal dural arteriovenous fistula (SDAVF) is the most common subtype of spinal arteriovenous malformations (AVMs). SDAVF often causes intramedullary edema, resulting in ischemic myelopathy and progressive paraplegia over time.

Aim: The purpose of this study was to investigate clinical- and imaging outcomes, following fluorescein-guided surgical treatment of SDAVF.
Methods
Patients were identified retrospectively via patient files.

Results: 12 patients (male = 10, female = 2) with an age ranging from 35 to 77 years of age were included. Patients predominantly presented with gait disturbance (n=12), balance disturbances (n=11), back pain (n=9), and/or radicular pain (n=8) to the lower extremities. After treatment, all patients experienced either complete remission- or some degree of improvement in gait disturbance (RR=1.00, (0.74-1.00)), balance disturbances (RR=1.00, 95%CI 0.72-1.00), back pain (RR=0.56, (0.21-0.86)), and/or radicular pain (RR=0.75 (0.35-0.97)). Intramedullary edema on magnetic resonance imaging was reduced by a mean 184.6 mm ((134.4-277)) postoperatively.

Conclusion: The results indicated that fluorescein-guided open surgical ablation of SDAVF is a safe and effective treatment and leads to clinical- and imaging improvement.

05: Traumatic atlantoaxial rotatory subluxation - report of 4 cases

Haisheng Li, *Phd, overlæge, ortopædkirurgisk afdeling, Aarhus universitetshospital.*

Background: Traumatic atlantoaxial rotatory subluxation is a rare condition in which patient present with the fixed head position turning extreme to the side. It is often result from a fall with the head down and subject the head to a compressional and rotational force. If left untreated, some cases may resolve spontaneously; however, other cases may result in the development of secondary changes in the bony anatomy of the atlantoaxial joint, leading to persistent deformity.

Diagnosis: Image diagnosis can easily be established by radiographs and CT scanning with three-dimensional reconstructions. MRI is useful to evaluate the ligament integrity.

Treatment: In the acute phase, the subluxation can be easily reduced by manual traction and reduction under general anesthesia or sedation. MR scanning after reduction to rule out ligament lesion if scanning do not exist preoperatively. Stiff collar is usually applied for 2 to 4 weeks depending on the severity. After removal of stiff collar, flexion-extension radiographs are useful to confirm stability.

Cases reported: The author present 4 cases from his own experience, one case that resolved spontaneously, two cases that needed manual reduction and stiff collar, and the last one that treated with manual reduction and halo-vest immobilization. Image diagnostics, classification, treatment algorithm according to AO principle, and video of manual reduction will be shared and discussed.

06: Traumatic spinal cord injury is correlated to increased risk of autoimmune/-inflammatory disease

***Tim Damgaard Nielsen*[1]**, *Thomas Munk Laursen[2], Bodil Hammer Bech[3,4], Mikkel Mylius Rasmussen[1,5]*

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Introduction: Traumatic spinal cord injury (TSCI) inflicts neurological function from the lesion site and caudally. TSCI ablates neuro-immunological interaction and immunological dysfunction develops resulting in chronic neuroinflammation and autoimmunity.

Spinal cord injury-immuno depression syndrome, and autonomic dysreflexia develops post-TSCI amplified by magnitude and level of TSCI. Both beeing systemically immunodepressive, thus protective against autoimmunity, but inevitably increases infectious susceptibility and the risk of being hospitalized for infections. A known risk factor of developing every autoimmune disease.

Post-TSCI autoimmunity has been observed in experimental murine studies and in observational human studies too, but there is an unelucidated distinction between autoimmunity - sensitization to self - and symptomatic autoimmune disease (AD).

Objectives: To evaluate if TSCI patients have an increased incidense rate ratio (IRR) of developing AD.

Methods: Based on a range of public Danish national registries, a nationwide studypopulation was collected from 1945-2018. The studyperiod was 1980-2018 and 1977-1979 was washoutperiod of prevalent cases with TSCI and AD. Specifically for Type 1 diabetes the studyperiod was 1988-2018 and 1987 was washout. A survival analysis was performed using Poissons Log-linear regression with person-years at risk as offset variable. The IRR was estimated for developing eight groups of ADs given a TSCI. Usual epidemiological confounders and, for ADs specifically, hospitalization for an infection was adjusted to evaluate the effect size of the modelled causal path.

Results: N= 4,877,836 individuals and 138,097,016 person-years (PY) at risk was included. Hereof 3,272 was diagnosed with TSCI constituting 50,865 PY at risk. A TSCI population had an overall IRR of 1·81 (95% CI 1·59; 2·05) of getting any autoimmune diagnosis. Further main study outcomes are displayed in table 2.

Conclusions: TSCI is an individual risk factor of developing certain ADs, especially those of neurologic origin. Furthermore, CCI and hospitalization for infections may be important modifiable risk factors.

Table 2: Study outcomes

Incidence rate ratios of autoimmune disease associated with traumatic spinal cord injury.

Autoimmune disease group	Exposure status	N	PY[d]	Rate; 1000^{-1}	1: Basic adjustment[a]	2: CCI adjusted[b]	3: Fully adjusted[c]
					Incidence rate ratio (95% CI)		
All incident types	TSCI	236	50,865	4·640	1·81 (1·59; 2·05)	1·53 (1·35; 1·74)	1·32 (1·16; 1·50)
	Non-TSCI	274,314	1·3805	1·987	1·00 reference	1·00 reference	1·00 reference
Endocrine & haematologic	TSCI	14	50,865	0·275	0·88 (0·52; 1·48)	0·79 (0·47; 1·33)	0·72 (0·43; 1·22)
	Non-TSCI	39,125	1·3805	0·283	1·00 reference	1·00 reference	1·00 reference
Gastroenterologic	TSCI	42	50,865	0·826	1·42 (1·05; 1·92)	1·22 (0·90; 1·66)	1·06 (0·78; 1·43)
	Non-TSCI	65,220	1·3805	0·472	1·00 reference	1·00 reference	1·00 reference
DM-1[e]	TSCI	55	47,803	1·151	2·01 (1·54; 2·61)	1·39 (1·07; 1·81)	1·13 (0·87; 1·47)
	Non-TSCI	51,846	1·1566	0·448	1·00 reference	1·00 reference	1·00 reference
Iridocyclitis	TSCI	7	50,865	0·138	0·86 (0·41; 1·80)	0·80 (0·38; 1·69)	0·70 (0·34; 1·48)
	Non-TSCI	14,449	1·3805	0·105	1·00 reference	1·00 reference	1·00 reference
MS[f]	TSCI	27	49,836	0·542	3·70 (2·54; 5·40)	3·46 (2·37; 5·04)	3·23 (2·21; 4·71)
	Non-TSCI	15,709	1·0748	0·146	1·00 reference	1·00 reference	1·00 reference
Dermatologic	TSCI	37	50,865	0·727	2·57 (1·86; 3·55)	2·26 (1·63; 3·11)	1·90 (1·37; 2·62)
	Non-TSCI	28,164	1·3805	0·204	1·00 reference	1·00 reference	1·00 reference
Other neurologic	TSCI	10	50,865	0·197	5·19 (2·79; 9·65)	4·37 (2·35; 8·14)	3·71 (1·99; 6·91)
	Non-TSCI	4,273	1·3805	0·031	1·00 reference	1·00 reference	1·00 reference
Systemic	TSCI	47	50,865	0·924	1·92 (1·44; 2·55)	1·73 (1·30, 2·30)	1·50; (1·13; 2·00)
	Non-TSCI	53,838	1·3805	0·390	1·00 reference	1·00 reference	1·00 reference

[a]Adjusted for sex, age, and calendar year.
[b]Adjusted for sex, age, calendar year, and Charlson comorbidity index.
[c]Adjusted for sex, age, calendar year, Charlson comorbidity index, and hospitalization for (bacterial/viral/other) infections.
[d]PY counts for Non-TSCIs are in 10^8 exponent.
[e]Studyperiod from 1988-2018.
[f]Studypopulation included from age of 12 years to let statistical model converge.
Abbreviations: PY; Person years, TSCI: traumatic spinal cord injury, DM-1; Diabetes mellitus type 1, MS; Multiple Sclerosis.
For specification of autoimmune diseasegroups see Appendix 1.

07: A traumatic spinal cord injury critical care porcine model

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Background: Intraspinal pressure relieve, spinal cord perfusion and immunomodulation have been suggested as treatments for traumatic spinal cord injury (TSCI). However, evaluation of these strategies in human subjects is limited with regards to using invasive and continuous modalities. Hence, there is a need for a long term sedated large animal model of TSCI, which this study aimed to establish in using pigs.

Methods: The animals were sedated for 72 hours being allocated either to TSCI or sham. Both groups were subjected to a 2.5 level laminectomy at TH7-TH9. The spinal cord injury was inflicted by a 75 g rod falling from 75 mm, with sustained compression for 5 min. Upon completion of the 72 hours, the spinal cord tissue was fixated and scanned using a diffusional tractography imaging sequence.

Results: 11 animals completed the trial whilst maintaining a stable physiology. A mean of 5243 (95%CI 2576 : 7910) tracks seeded at the cranial end of each sample in the sham group, whilst a mean of 2627 (95%CI 1448 : 3806) tracks seeded in the SCI group. In the sham group a mean of 4937 (95%CI 2262 : 7611) tracks reached the caudal end of the sample, whereas for the SCI group a mean of 1161 (95%CI -61 : 2384) reached the caudal end. There was a significant mean difference between groups of 3775 tracks (95%CI 1333 : 6217 p = 0.0073).

Discussion/Conclusion: This is to our knowledge, the first critical care large animal model of TSCI. We were successful in keeping the animals stable for 72 hours of anesthesia. The tractography analysis found tracks to traverse the injury site in all animals, implying that the injury was incomplete. This could be of great importance since incomplete injury have greater therapeutic potential.

08: Rate of unexpected malignancy in patients with vertebral compression fracture undergoing percutaneous vertebroplasty – six years after implementation of a new magnetic resonance imaging scanning protocol

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Objective: To investigate if the rate of unsuspected malignancy in biopsies in patients with VCF who underwent PVP at the same othopeadic department has changed after implementation of a new MRI scanning protocol.

Summary of Background Data: Discrimination between benign and malign vertebral compression fracture (VCF) can be difficult. However, early diagnosis of malignant VCF is crucial to further treatment and prognosis. An earlier study at an orthopeadic department reported a rate of unsuspected malignancy of 4.9% in patients with VCF who underwent percutaneous vertebroplasty (PVP) when biopsies were obtained during the procedure. MRI scanning protocol was changed in this period.

Methods: Retrospective on 427 patients with vertebral compression fracture undergoing PVP from 28th of April 2017 to 28th of April 2022, identifying operated patients from the Danish national DaneSpine registry. Subsequently, individual clinical information was collected in journal records.

Results: The rate of unsuspected malignancy was 0.9% (4/427) and the overestimation of malignant VCF was 50% (16/32).

Conclusion: During the last 5 years, the rate of unsuspected malignancy in patients with VCF undergoing PVP has improved considerably from 4.9% to 0.9%. Furthermore, MRI is over-diagnosing malignancies. Thus, the new scanning procedure is effective in differentiating between benign and malign VCFs.

DEGENERATIV RYG

Sessionsformand: Louise Møller Jørgensen

15:10- 16:30

09: Comparing Patient-Reported Outcomes of Lateral to Paramedian Lumbar Disc Herniation: A Propensity-Score Matched Observational Study

Gustav Østerheden Andersen*, Stefan Milosevic, Mads Moss Jensen, Leah Carreon, Casper Friis Pedersen, Mikkel Østerheden Andersen and Peter Helmig.*

10: Perioperative opioid consumption in patients who undergo surgery due to spine related pain.
- A Danish nationwide cohort study.

Andreas K. Andresen *MD, Leah Y Carreon MD, Casper Friis Pedersen, Mikkel Østerheden Andersen MD, DaneSpine Collaboration group*

11: Spinal Decompression and Posterolateral Fusion Improves Walking Capacity and Balance and Reduces Residual Urine in Patients with Spinal Stenosis

Andreas K. Andresen *MD, Leah Y Carreon MD, Mikkel Østerheden Andersen MD*

12: Usability and performance expectancy determines the use of a clinical decision support system in spine surgery

Søren Eiskjær, *MD, Casper Friis Pedersen MSSc, Simon Toftgaard Skov MD, PhD, Mikkel Østerheden Andersen MD*

13: Presence of Magnetic Resonance Imaging Proxies (MRIPs) for segmental instability is associated with increased leg pain at five-year follow-up after decompression surgery for spinal stenosis without spondylolisthesis

Signe Forbech Elmose MD*; Mikkel Oesterheden Andersen MD; Leah Yacat Carreon M.D. MSc.; Freyr Gauti Sigmundsson, MD Ph.D.*

14: Discrepancies in visitation and lost work ability - a nationwide register study of incident low back pain patients with lumbar disc herniation

Kjeldgaard, Mikkel*; Christensen, B. S.; Thomsen, J. N. L.; Skovsgaard, C.; Bjarkam, C. R.*

15: Outcomes and Complications after Two-Level Anterior Cervical Discectomy and Fusion (ACDF) with or without Anterior Plating: A Propensity Matched Cohort study

Jenny Kornberg Msc, *Kristian Høy MD, PhD, Mikkel Østerheden Andersen, MD, Leah Y Carreon, MD, PhD*

16: External Validation of Prognostic Models to Predict Outcome in Danish Patients Considering Spine Surgery

Casper Friis Pedersen *MSSc, Mikkel Østerheden Andersen MD, Leah Yacat Carreon MD, MSc, Søren Eiskjær MD, Rachid Bech-Azeddine MD, PhD*

17: Assessment of an expandable PEEK/metal interbody cage used in open surgery TLIF, a retrospective study

Kresten Rickers, *Charlotte Meyers Sommer, Jon Kaspersen, Dhia Al-Fadli, Søren Eiskjær*

18: Medial branch nerve denervation by cryoneurolysis and radiofrequency in patients with facetogenic chronic low back pain– results from a single-blinded randomized controlled trial

K. Truong*, K. Meier L.C Ahrens, T. Wickmann, H. Zaer, L.H Tiroke, S. Arvin, M. Bazys, P. Duel, G. Gudmundsdottir, J.G Carlsen, L. Nikolajsen, M.W. van Tulder, J.C.H Sørensen and M.M Rasmussen*

19: Preoperative risk factors for non-satisfaction after lumbar fusion

Cyrus Zamany, ***Søren Ohrt-Nissen****, Mikkel Ø Andersen, Peter Muhareb Udby, MD, DC, PhD*

09: Comparing Patient-Reported Outcomes of Lateral to Paramedian Lumbar Disc Herniation: A Propensity-Score Matched Observational Study

Gustav Østerheden Andersen, Stefan Milosevic, Mads Moss Jensen, Leah Carreon, Casper Friis Pedersen, Mikkel Østerheden Andersen and Peter Helmig.

Aim: The aim of this study was to investigate the patient-reported outcomes (PROs) following lumbar discectomy on patients with lateral lumbar disc herniation (LDH) compared to patients with paramedian LDH as a reference to the standard.

Background: Surgery for disc herniation is one of the most common surgical procedures of the lumbar spine.

LDHs can be divided into median, paramedian, foraminal and extraforaminal types based on the anatomical site of the lesion. Lateral (foraminal and extraforaminal) LDH surgery is considered challenging compared to paramedian LDH surgery.

Methods: Data on patients with lateral and paramedian LDH, operated between 2017 and 2020 at a single public spine unit, was extracted from the National Danish Spine Registry, DaneSpine. A propensity score-matched, case-control analysis was conducted to compare the two groups. Subgroup analysis was made by further dividing the lateral LDHs into a foraminal and extraforaminal group.

Patient demographics, Oswestry Disability Index (ODI), Visual Analogue Scale (VAS) of leg and back pain (0-100), EuroQol-5D questionnaire (EQ-5D), measures of patient improvement and satisfaction were collected at baseline and 1-year postoperatively.

Results: Of 887 eligible patients, baseline and 1-year follow-up data was available on 525 paramedian and 68 lateral LDH patients. Following propensity-score matching the two groups were similar in terms of all baseline characteristics ($P < 0.05$). There was no significant difference between the paramedian and lateral LDH group in ODI, VAS leg pain, VAS back pain and EQ-5D 1-year postoperatively. Both groups improved in all outcomes from inclusion to follow-up ($P = 0.001$).

Subgroup analysis showed that patients with foraminal LDH, compared to extraforaminal LDH, had a significantly greater improvement in VAS leg pain ($P = 0.016$) with an equivalently higher number of patients with clinically significant leg pain improvement ($P = 0.03$).

Conclusion: Lateral and paramedian LDH patients reported similar postsurgical outcomes. Spine surgeons should be less hesitant to operate patients with lateral LDH. Extraforaminal LDH patients experienced the least relief of leg pain.

10: Perioperative opioid consumption in patients who undergo surgery due to spine related pain.
- A Danish nationwide cohort study

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Background: During the last decade the use of opioids in management of non-malignant spine pain has increased in Danish society. While opioids are useful for treating acute- and postoperative pain, preoperative opioid use is associated with increased morbidity, worse pain and disability, reduced quality of life, and a risk of prolonged usage postoperatively.

The purpose of the study is to describe the spine related opioid consumption, in patients who undergo surgery due to spine pain.

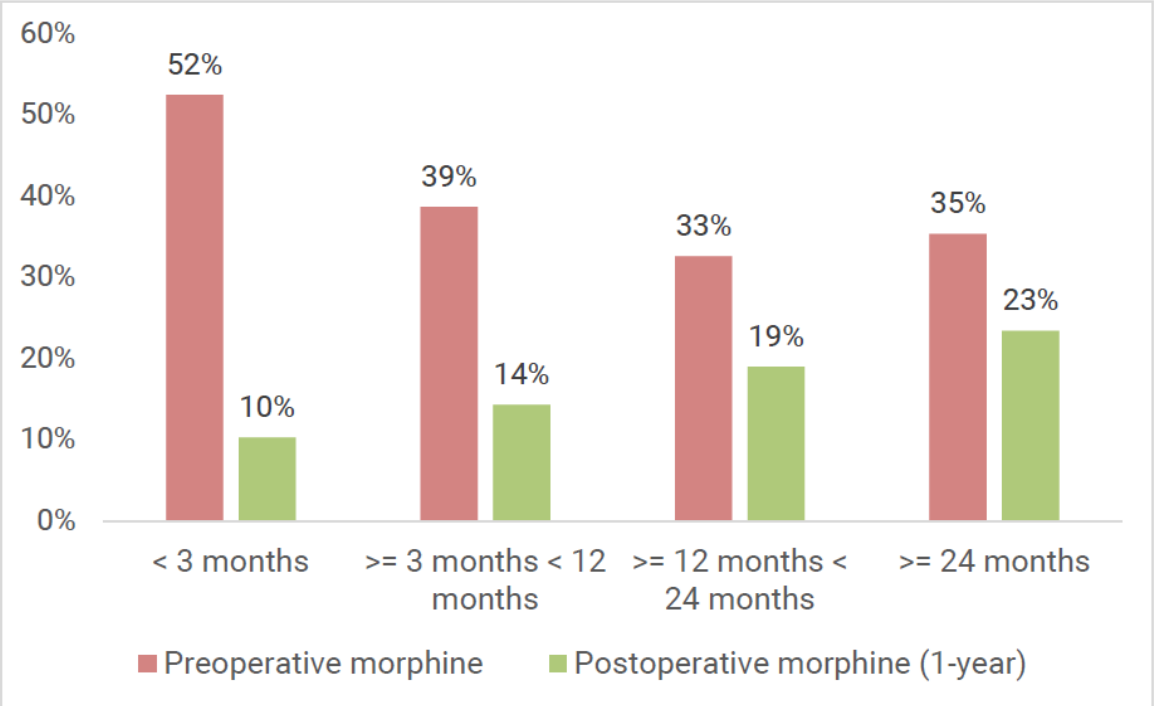
Method: Nationwide retrospective cohort study, including patients who underwent surgery from 2016-2021 in an institution who report to DaneSpine.

Patients were asked if they used prescription opioids due to spine pain preoperatively and at one-year follow up, furthermore they were asked for information on age, gender, duration of pain, and a standard battery of PROs including EQ-5D, ODI, VAS back- and leg-pain.

Results: We had pre- and postoperative information on opioid use available on 12.654 patients, of these 10.7% underwent surgery due to spondylolisthesis, 54.5% due to spinal stenosis and 34.7% due to disc herniation. Both Pre- and postoperative opioid-use decreased from 2017 to 2021. 37.4% of all patients had prescription opioids before surgery. At one year follow up this was down to 17.9% ($p<0.001$). While 23.6% of the patents stopped using opioids, 4.8% of preoperatively opioid naïve patients were on opioids at one-year follow up. Opioid use was correlated to duration of leg-pain, and patients with longer duration of pain were more likely to use opioids after surgery (Fig.1). This lack of reduction in postoperative opioid-use was more present in patients with spinal stenosis.

Conclusion: While opioid use in general is down over the last 6 years, a correlation between duration of leg-pain and prolonged opioid use after surgery was found. This correlation was strongest in patients who underwent surgery due to spinal stenosis.

Figure 1: Pre- and postoperative morphine use(2016-2021) by duration of leg pain.



11: Spinal Decompression and Posterolateral Fusion Improves Walking Capacity and Balance and Reduces Residual Urine in Patients with Spinal Stenosis

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Introduction: Patients with lumbar spinal stenosis complain of leg pain, impaired walking capacity and loss of balance. In addition, stenosis has been suggested to cause urinary retention but this has not been extensively studied.

The purpose of the study is to investigate whether walking capacity, balance and residual urine volume will improve after decompression and fusion surgery.

Methods: Patients scheduled for decompression and fusion due to spinal stenosis with grade 1 degenerative spondylolisthesis were enrolled.

Walking distance was measured and timed (maximum of 1000m). Tandem test was performed, at 10 second intervals patients were asking to stand side-by-side, in semi-tandem and in tandem position. Patient scores range from 0-30.

A post voiding ultrasonic bladder scan was performed by a registered nurse. Patients were grouped based on post void bladder volume above or below 100ml.

Results: 101 patients were included in the study, mean age was 70.7 years, 77% were female, of these 90% had symptoms for more than 6 months prior to surgery.

Preoperatively, patients had a mean walking distance of 123.9meters (86.5;161.2), which increased to 791.1m (722.6;859.7) at one-year follow up ($p<0.001$). The correlating walking speed was 0.91m/s (0.86;0.97) preoperatively, with an increase to 1.17m/s (1.12;1.22) at 1 year follow up ($p=0.02$).

The tandem test had a mean preoperative score of 19.6 (17.7;21.24), an increase to 26.0 (24.7;27.4) was seen at 3 months follow up, and was sustained after 2 years 12 (11.9%) of patients had more than 100ml residual urine at preoperative, this was down to 2 patients at 3 months follow up, and at 24 months follow up zero patients had significant urine retention.

Conclusions: Patients who had decompression and fusion due to spinal stenosis with grade 1 spondylolisthesis had severe neurological impairment regarding walking capacity, balance, and urine retention which, regardless of chronicity, was significantly improved.

12: Usability and performance expectancy determines the use of a clinical decision support system in spine surgery

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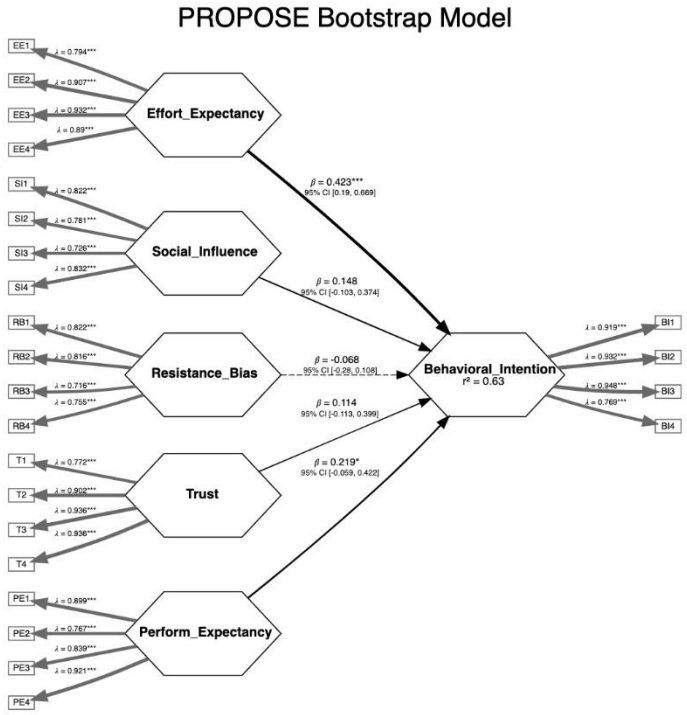
Study design: Quantitative survey study.

Objectives: The aim of the current study was to develop a model for the factors that drive or impede the use of an AI clinical decision support system (CDSS) PROPOSE supporting the shared decision making on the choice of treatment of ordinary spinal disorders.

Methods: Sixty-two spine surgeons were asked to answer a questionnaire regarding behavioral intention to use the CDSS after being presented for PROPOSE. The model behind the questionnaire was the unified theory of acceptance and use of technology (UTAUT). Data were analyzed using PLS-SEM.

Results: The most important and significant factors were the degree of ease of use associated with the new technology – effort expectancy/usability followed by performance expectancy - the degree to which an individual believes that using a new technology will help him or her to attain gains in job performance. Social influence and trust in the CDSS were other factors in the path model. r^2 for the model was 0.63 – indicating that almost two thirds of the variance in the model was explained. The only significant effect in the multigroup analyses of path differences between two subgroups was for PROPOSE use and social influence (p = 0.01)



Conclusion: Shared decision making is essential to meet patient expectations in spine surgery. A trustworthy CDSS with ease of use and satisfactory predictive ability and promoted by the leadership will stand the best chance of acceptation and bridging the communication gap between surgeon and patient.

13: Presence of Magnetic Resonance Imaging Proxies (MRIPs) for segmental instability is associated with increased leg pain at five-year follow-up after decompression surgery for spinal stenosis without spondylolisthesis

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Purpose: Studies have identified Magnetic Resonance Imaging proxies (MRIPs) that are associated with radiologic lumbar segmental instability. These include presence of facet joint effusion, sagittal orientation of the facet joints and preserved disc height. The purpose of this study was to investigate if patient reported outcome measures (PROMs) at five-years after surgery are associated with the presence of preoperative MRIPs for segmental instability in patients with lumbar spinal stenosis (LSS) treated with decompression alone.

Methods: Retrospective cohort study. Patients with LSS at L4/L5 undergoing decompression surgery from 2010-2017, with preoperative supine MRI showing slip < 3 mm 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 presence or absence of MRIPs and propensity matched. Changes in ODI, EuroQol-5D, VAS back and leg baseline, one-, two- and five-year post-operative were analyzed.

Results: 104 patients met inclusion criteria, 83 MRIP(-) and 21 MRIP(+). Propensity matching resulted in 21 in each group. Patients in both groups showed significant improvement in all PROMs post-operative. 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: In patients with LSS and slip < 3 mm, presence of MRIPs for instability preoperatively may be associated with less improvement in leg pain five-years after decompression only surgery. However, presence of MRIPs did not influence negatively on other PROMs.

14: Discrepancies in visitation and lost work ability - a nationwide register study of incident low back pain patients with lumbar disc herniation

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Background: Low back pain (LBP) due to lumbar disc herniation (LDH) is a major cause of reduced functionality among younger citizens. While LDH occurrences are expected to be evenly distributed in the Danish population, the Danish Back Database reports vast regional differences in referral to specialized spine care.

Aim: To elucidate if the national admission differences of patients aged 18-65 years with incident LBP caused by LDH impact the ability to regain previous workability.

Methods: Through Danish National Registries 30,082 patients were included and were divided as 21,087 of high- (>80%), 2,568 of intermediate- (20-80%), and 6,427 of low (<20%) workability, according to their workability one year prior to admission. Data were presented as descriptive- and inferential statistics.

Results: Patients with a previous intermediate- or high level of workability were referred to medical departments in Region of Southern Denmark (80%), -Zealand (53%) and -Central Jutland (57%), surgical departments in Northern Jutland (46.5%), and emergency departments in the Capitol Region (40.5%). Patients with low workability were more likely referred to surgical departments (44%), despite only 4% received surgery.

The majority sustained their workability (65% of high- and 52% of intermediate workability), while respectively further 13% and 25% would regain any lost workability within 0.5 years, regardless of department. Reciprocally, 88% of patients with already low workability, would remain with low workability, and only 8% would gain an ability >20% within 0.5 years.

Conclusion: The referral of LDH-patients with persistent LBP lacks national consensus in Denmark. The condition is generally benign and suitable for medical spine care. However, many are referred directly to surgical departments, which also receive numerous non-work-active patients, despite few receive surgery. Initial management by medical spine specialists, referring only patients relevant for surgical evaluation, could be more appropriate for patient-, and health-care resources

15: Outcomes and Complications after Two-Level Anterior Cervical Discectomy and Fusion (ACDF) with or without Anterior Plating: A Propensity Matched Cohort study

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Background Context: Anterior cervical discectomy and fusion (ACDF) is the current standard of treatment for disc herniation and radiculopathy resistant to non-operative care. ACDF can be performed with or without plating, but the use of plate versus stand-alone cage is still a matter of debate.

Methods: Prospective data from 96 patients with MRI verified cervical foraminal stenosis or disc herniation, eligible for two-level ACDF surgery, were identified and collected from The Danish National Spine Registry, DaneSpine. Demographics, patient reported outcomes, previous spine surgery and reoperations were all patient-reported using questionnaires pre- and minimum 1-year postoperative. The patients were divided into two groups, plated or not. To minimize baseline differences, propensity-score matching was applied based on age, gender, body mass index, smoking status, pre-op neck and arm pain, EQ-5D and NDI. One-year postoperative x-rays were examined to determine the amount of subsidence.

Results: A total of 86 (89,6%) patients undergoing two-level ACDF surgery had completed pre-op, surgical and one-year follow-up data. Thus, two matched cohorts consisting of 37 patients could be created. Interestingly plated patients reported significantly lower neck-pain (24.1 vs. 40.1 p=0.018) and higher EQ-5D (0.76 vs 0.62 p=0.038) scores one year after surgery compared to those without. At follow-up, there were no difference in subsidence (8 vs 9, p=1.000) or revision rates (1 vs 2, p=0.389) between the two groups.

Conclusion: Anterior plating in patients undergoing two-level ACDF leads to less neck pain compared to no plate but does not reduce cage subsidence or reoperation rate.

Table 2: Summary of PROs at baseline, follow-up and change.

	Preoperative		p	1- year postoperative		p	Delta Δ - value		p
	+ plate, mean (SD)	-plate, mean (SD)		+ plate, mean (SD)	-plate, mean (SD)		+ plate, mean (SD)	-plate, mean (SD)	
VAS neck	54.78 (29.40)	59.57 (21.84)	0.430	24.06 (24.12)	40.11 (30.38)	0.018	34.73 (36.54)	20.11 (27.72)	0.069
VAS arm	65.70 (23.40)	60.05 (23.85)	0.307	27.97 (27.51)	35.58 (28.12)	0.282	38.63 (31.91)	24.42 (33.38)	0.089
EQ-5D	0.53 (0.29)	0.43 (0.29)	0.146	0.76 (0.26)	0.62 (0.30)	0.037	0.24 (0.35)	0.19 (0.39)	0.600
NDI	38.19 (15.44)	43.14 (15.12)	0.168	22.64 (17.97)	29.97 (16.44)	0.082	18.27 (18.05)	12.53 (16.74)	0.176
SF-36 PCS	35.17 (7.71)	34.49 (7.32)	0.705	43.07 (10.50)	39.74 (9.57)	0.172	7.63 (11.71)	6.11 (9.70)	0.564
SF-36 MCS	44.65 (11.80)	44.16 (11.14)	0.858	54.21 (8.34)	48.01 (12.00)	0.017	9.89 (9.65)	3.47 (13.07)	0.028

BMI, Body Mass Index; EQ-5D, Euroqol 5 Dimension; MCS, Mental Component Score; NDI, Neck Disability Index; PCS, Physical Component Score; SF-36, Short Form 36 Health Survey Questionnaire; VAS, Visual Analogue Scale.

16: External Validation of Prognostic Models to Predict Outcome in Danish Patients Considering Spine Surgery

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Background: Lumbar spinal stenosis (LSS) and lumbar herniated disc (LHD) are the most common surgically treated degenerative spinal conditions in Denmark with an estimated yearly activity of 4.000+ operations. Surgery provides pain relief, functional improvement, and betterment of quality of life for the majority. Between 10 and 40% of patients, however, do not benefit from surgical intervention.

To aid clinicians in identifying surgical candidates who are at risk of an unfavourable outcome, we have developed predictive models, based on data from the national Danish spine registry, DaneSpine.

Before introducing predictive models in practice, it is paramount to ensure they are applicable to a wider population outside development. The purpose of this study was to evaluate the generalizability and reliability of our models, by applying them to patients independent of model development.

Methods: Cohorts for external validation were identified in DaneSpine. They consisted of 2.007 LSS and 1.044 LHD patients with complete follow-up at 1-year operated at Centre for Spinal Disease, Glostrup Hospital, Denmark between 2009 and 2022. Data were prepared by encoding dichotomized outcome variables and applying MCID thresholds defined before model development. Performance metrics were calculated as area under the curve, sensitivity, specificity, positive predicted value, negative predicted value, accuracy, Brier score, and Cohen's Kappa.

Outcome measures	AUC	ACC	SENS	SPEC	PPV	NPV	Brier	Kappa
Lumbar herniated disc								
EQ-5D	0.84	0.77	0.60	0.87	0.73	0.79	0.15	0.49
ODI	0.71	0.71	0.42	0.90	0.71	0.72	0.19	0.34
VAS leg	0.73	0.77	0.35	0.91	0.76	0.77	0.16	0.36
VAS back	0.80	0.75	0.47	0.94	0.83	0.73	0.17	0.44
Return to work	0.77	0.88	0.37	0.97	0.69	0.89	0.10	0.42
Spinal stenosis								
EQ-5D	0.81	0.77	0.76	0.77	0.80	0.73	0.17	0.53
ODI	0.75	0.70	0.76	0.65	0.70	0.71	0.20	0.40
VAS leg	0.70	0.67	0.32	0.94	0.94	0.65	0.21	0.28
VAS back	0.75	0.70	0.47	0.89	0.77	0.68	0.19	0.28
Return to work	0.77	0.88	0.37	0.97	0.69	0.89	0.10	0.42
Walking distance	0.77	0.71	0.52	0.86	0.76	0.68	0.19	0.40

Discussion/conclusions: Results indicate that models are reliable across different settings. Performance was consistent with findings following model development. For LHD patients, models were notably adept at detecting failures measured by EQ-5D and risk of not returning to work. Interestingly, risk of not achieving MCID measured by VAS leg pain for LSS patients was difficult to predict and reflects previous findings. Future research should concentrate on improving models with the purpose of optimizing failure detection capabilities. This could be achieved by introducing new predictive algorithms, careful adjustment of probability thresholds and enriching data.

17: Assessment of an expandable PEEK/metal interbody cage used in open surgery TLIF, a retrospective study

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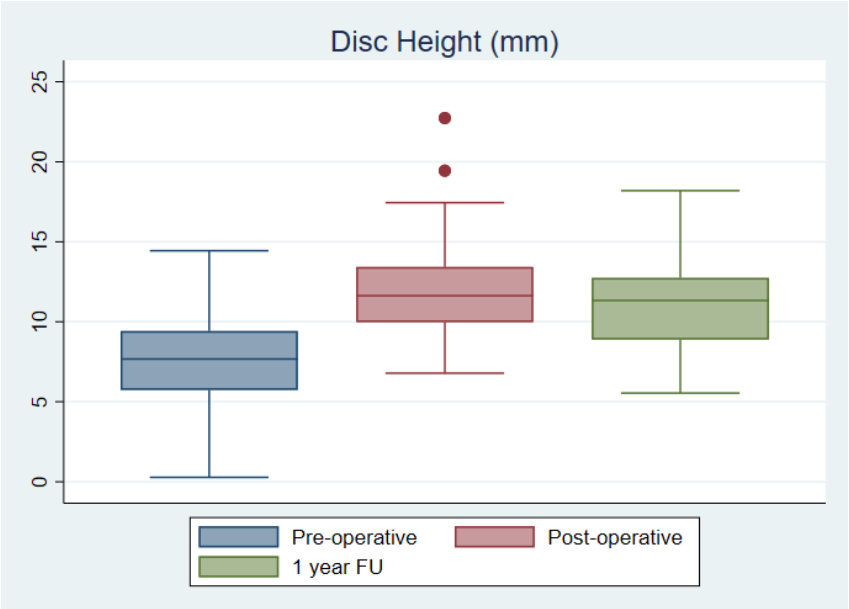
Background: Expandable cages for interbody fusion have become increasingly popular especially in minimal invasive surgery (MIS). One of the advantages of these cages is claimed to be better restoration of discus height and thereby also better restoration of lordosis. Disadvantages is the price and possibly higher risk of subsidence, when the cage is expanded in the disc space.

Method: A retrospective observational study of patients operated on at Aalborg University Hospital, Department of Orthopedic Surgery in the period 2018 – 2022. Inclusion criteria were age over 18 years who underwent open surgery TLIF in the lumbar spine (L3-S1). Outcomes were complications in terms of dural-lesion, nerve damage, implant subsidence or migration, and re-operation measured. Radiological outcomes were change in disc height and segmental lordosis, and fusion rate measured after 1 year.

Results: Ninety-seven patients met the inclusion criteria. Four patients were re-operated, the reasons were not related to the cage. Six dural-lesions and no nerve damage were reported. Subsidence occurred in 9 cases, there was no migration of cages. Average disc height before surgery was 7.8mm and was significantly (P<0.01) increased to 11.4mm after one year. There was no significant difference in lordosis before and after surgery. In 51% of patients there was interbody fusion, Bridwell grade 1 and 2.

Discussion: The use of an expandable cage proved comparable to previously reported outcomes of non-expandable cages in terms of complications (Subramanian et al, 2023) and correction of lordosis. The fusion rate was lower than expected, but most likely difficult to assess due to the metal part in the cage. Restoration of disc height proved significantly better than previous studies where non-expandable cages were used. An increase of 3,6mm is also considerably better than compared to minimally invasive surgery where the average disc height restoration is 1.14mm (Alvi et al, 2019).



18: Medial branch nerve denervation by cryoneurolysis and radiofrequency in patients with facetogenic chronic low back pain– results from a single-blinded randomized controlled trial

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Introduction/purpose: Low back pain (LBP) is the most common musculoskeletal complaint in health care, accounting for 570 million cases globally. While the majority of LBP episodes are self-limiting, up to 7% will develop chronic LBP, with the facet joints being a common source of pain. Radiofrequency denervation (RF) of the medial branch nerve (MBN) has been shown to provide pain relief, despite some conflicting evidence. Cryoneurolysis has been proposed as an alternative method, however no randomized controlled trial have yet been conducted. Here we report on a randomized controlled trial comparing MBN denervation by cryoneurolysis and RF combined with physical therapy in patients with facetogenic chronic LBP for long-term pain relief.

Methods: A single-center, single-blinded randomized clinical trial conducted at the Department of Neurosurgery at Aarhus University Hospital, Denmark. Participants with facetogenic chronic LBP for more than 3 months with pain intensity of at least 4 on the numeric rating scale (NRS) and a positive response to a diagnostic medical branch block (MBB) were randomized 1:1:1 to either cryoneurolysis, radiofrequency denervation or placebo of the pain generating facet joints. All participants received specialized physical therapy 4 weeks after receiving the intervention. Follow-up was conducted at 4 weeks, 3, 6 and 12 months. Primary outcome was Patients' Global Impression of Change (PGIC) at 4 weeks follow-up. Secondary outcomes include NRS, Oswestry disability Index (ODI), Short Form 36 (SF-36), Major Depression inventory (MDI), Pain Catastrophizing Scale (PCS) and the European Quality of Life – 5 Dimensions (5Q-5D). Statistical analyses done in Stata 17 © using linear Generalized Linear Model (GLM) with log-link function to calculate risk ratio (RR) with 95 % confidence interval (95% CI). Secondary outcomes were analyzed by linear regression model or linear mixed models. Differences with $P < 0.05$ were considered statistically significant.

Results: 120 participants were randomized between 2020 to 2022 to either RF, cryoneurolysis or placebo. Baseline characteristics and demographics were comparable except for gender and alcohol consumption. Pairwise comparison of cryoneurolysis and RF with reference to placebo found that the risk or (must be) chance of scoring PGIC$\underline{<}$ 2 at 4 weeks' follow-up was double (2-times) for cryoneurolyse (RR: 2; 95% CI: 0.75 to 5.33, p=0.166) and 60% higher for RF (RR: 1.6; 95% CI: 0.57 to 4.49, p=0.370) compared to the placebo group. These findings were not statistically significant (P > 0.05), despite adjusting for gender and alcohol consumption. Secondary endpoints showed similar findings including for pain intensity and functional status at all follow-up times.

Discussion/ Conclusion: Denervation of the MBN by RF and cryoneurolysis did not demonstrate any statistical improvement in the impression of change, pain intensity, functioning, health and mental status over placebo during the 12-month follow-up time in patients with facetogenic chronic LBP.

19: Preoperative risk factors for non-satisfaction after lumbar fusion

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Background/purpose: Lumbar interbody fusion is a procedure associated with considerable variation in terms of patient-reported outcomes (PRO) and satisfaction with treatment. The purpose of the study was to evaluate preoperative risk factors associated with a non-satisfactory patient-reported outcome post-surgery.

Method: This was a registry-based cohort study from the national Danish surgical spine database (DaneSpine) on patients undergoing single-level lumbar instrumented fusion.

Data from an eight-year period, on patients undergoing single level fusion with either posterior- (PLIF) or transforaminal lumbar interbody fusion (TLIF) was collected pre- and postoperatively from DaneSpine. The primary outcome was patient nonsatisfaction with treatment. Secondary variables included European Quality of Life–5 Dimensions (EQ-5D), visual analog scale (VAS), Oswestry Disability Index (ODI) score, pain intensity, duration of back pain, previous discectomy and expectations regarding return to work after surgery.

Results: The cohort included 453 patients of which 84 (19%) reported treatment nonsatisfaction. Preoperative data from the nonsatisfaction group demonstrated higher VAS scores for back pain (75±19 vs. 68 ±21, p=0.006) and leg pain (65±25 vs. 58±28, p=0.004). Treatment nonsatisfaction was 13% for patients with preoperative VAS score 0-40, 15% for VAS 41-79 and 25% for VAS 80-100. Preoperative EQ-5D score was significantly lower in the non-satisfied group (0.203+0.262 vs. 0.291±0.312, p=0.016). There was no significant difference between the groups in terms of preoperative ODI score, age, body mass index, duration of back pain, walking distance or rate of preoperative sick leave. Also, there was no difference in terms of preoperative employment status or patient expectations on return to work after surgery.

Conclusion: Higher preoperative back and leg pain along with lower EQ-5D scores were risk factors for nonsatisfaction after lumbar interbody fusion. There was a substantial drop-off in satisfaction rate for patients who report severe preoperative pain. Patient information on expected outcome after surgery should include an evaluation of preoperative pain and disability-scores.

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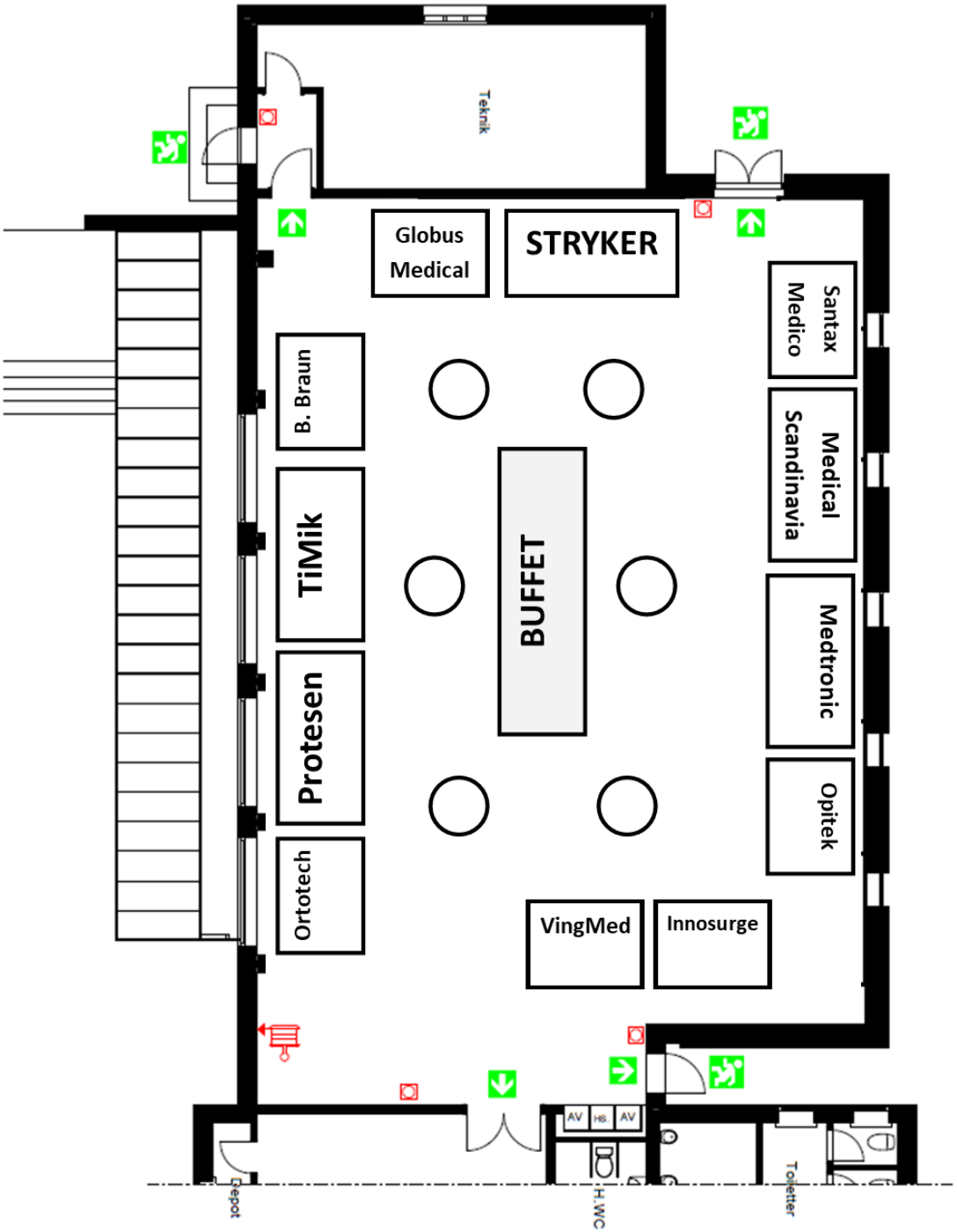

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