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Mounting the Learning Curve in Unilateral Biportal Endoscopic Lumbar Decompression in an Asian Population: Experience of a Single Surgeon's First 105 Consecutive Cases with Early Functional Outcomes

VINCENTIUS E L1*, WONG H P N1, LIM Z Y1, HUANG Y1

1Department of Orthopaedic Surgery, Sengkang General Hospital, Singapore (SKH)

*To whom correspondence should be addressed to

Study Design: Retrospective Cohort Study

Introduction/Objectives: This study evaluates the efficacy and safety of unilateral biportal endoscopic (UbE) lumbar decompressive surgery with a focus on outcome, technique and temporal relationship between surgeon experience and operative time.

Materials/Methods: We performed a retrospective analysis of the first consecutive 105 patients undergoing unilateral biportal endoscopic lumbar decompression (99 single level and 6 double level) for symptomatic MRI-proven lumbar herniated disc and/or spinal stenosis by a single surgeon at our institution. Data encompassed demographics, preoperative and postoperative assessments, operative details, complications as well as patient reported outcome measures (PROM).

Results/Discussion: Our patients presented with diverse symptoms, predominantly lower limb pain/radiculopathy (93.3%) and lower back pain (75.2%). The commonest level operated on was L4/L5 (56.2%), followed by L5/S1 (31.4%), L3/L4 (13.3%) and L2/L3 (4.8%). Bilateral decompression was performed via a single unilateral incision in 45.7%. Operative time averaged 117.58 ± 48.5 minutes per level with shorter times being associated with increased surgical experience ($r=-0.254$, $p<0.05$) and longer times associated with higher BMI ($r=0.209$, $p<0.05$). Left-sided and L5/S1 level decompression were associated with quicker operative time, without reaching statistical significance. Improvement in surgical time largely occurred over an initial learning curve of 60 cases, which thereafter tended to plateau. In the immediate postoperative period, all patients experienced improvement in symptoms with 54.3% having complete symptomatic relief. Length of hospitalization averaged 1.9 days. Complications were minimal with 3 dural tears (2.86%), 1 postoperative wound bleeding (0.95%) and 2 acute urinary retention (1.9%). No cases of infection, foot drop or conversion to open decompression were identified. Intraoperative dural tears were repaired successfully endoscopically. PROM at 1- and 3-month mark showed significant improvements in VAS, ODI and SF-36. Relook surgery for persistent symptoms was required in 3 cases (2.86%) at 3-4 months follow-up.

Conclusion: UbE lumbar decompression demonstrated favorable outcomes, in terms of symptomatic relief, functional scores and length of stay with few complications. Surgical times improved with increased experience, suggesting feasibility with practice. We recommend acquiring adequate surgical experience with spinal anatomy and management of intraoperative complications from traditional approaches before transitioning to endoscopic decompression, and to embark on learning UbE approach under supervision with careful patient selection (surgery-naïve spine; small body habitus; unilateral single-level pathology at L5/S1 or L4/5 level; left-sided approach for a right-handed surgeon). Given limitations such as retrospective single-cohort design and short follow-up, as well as increased operative costs, further longer-term comparative studies are warranted to establish its superiority and cost-effectiveness.

2

Robotic-assisted Versus Conventional Lumbar Spine Pedicle Screw Insertion: A Systematic Review and Meta-analysis of Randomised Controlled Trials

Vikaesh Moorthy1, Grace Hui Zhen Chua1, Quan You Yeo2, Jacob Yoong-Leong Oh1

1Department of Orthopaedic Surgery, Tan Tock Seng Hospital, Singapore 2Department of Orthopaedic Surgery, Woodlands Health Campus, Singapore

Introduction: Accurate pedicle screw fixation in spine surgery is important to ensure stability and decrease risk of neurological, vascular and visceral injuries1. Robotic-assisted pedicle screw insertion has recently emerged as an alternative to the traditional free-hand technique, with advantages of increased accuracy of screw position and reduced radiation exposure2. However, discrepancies in the accuracy of screw placement between the 2 methods have been highlighted by some comparative studies. This meta-analysis was conducted to synthesize level 1 evidence comparing these techniques.

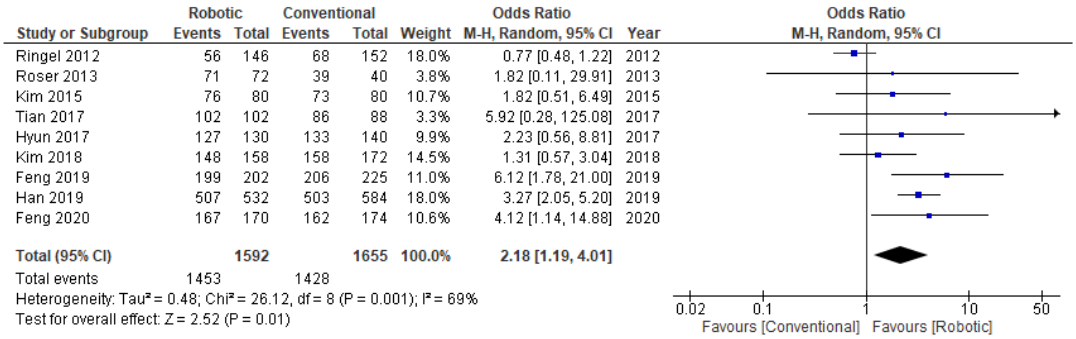
Methods: Searches were conducted in 3 electronic databases adhering to specific eligibility criteria. We included studies that were randomized controlled trials (RCTs) comparing robotic-assisted versus conventional pedicle screw placement in the lumbar spine surgery, assessing primary outcome of accuracy of pedicle screw placement and secondary outcomes including intraoperative blood loss, pedicle screw revision rate, surgical duration, length of hospitalisation and final postoperative VAS back and leg pain scores. The data was analyzed using RevMan software and the results are presented as odds ratios (ORs), or standard mean differences (SMDs) with 95% confidence intervals (CIs). Our analysis included 11 publications (3 of which pertained to the same randomized trial), involving 700 patients and 3247 screws.

Results: The results demonstrated a trend towards higher rates of Grade A Gertzbein and Robbins pedicle screw placement (OR: 2.18, 95% CI: 1.19-4.01, p=0.01), and lower rates of Grade C+D+E Gertzbein and Robbins pedicle screw placement (OR: 0.52, 95% CI: 0.15-1.76, p=0.29) in the robotic group, as compared to the conventional group. The rate of proximal facet violation was also significantly lower in the robotic group (OR: 0.16, 95% CI: 0.06-0.39, p<0.001) (Figure 1). In terms of intraoperative and postoperative outcomes, as compared to the conventional group, the robotic group had significantly lower blood loss (SMD: -68.03, 95% CI: -101.34 to -34.72, p<0.001) and lower pedicle screw revision rates (OR: 0.21, 95% CI: 0.07 to 0.62, p=0.005). The surgical duration (SMD: 7.01, 95% CI: -7.06 to 21.08, p=0.33), length of hospitalisation (SMD: -0.36, 95% CI: -1.03 to 0.31, p=0.30), final postoperative VAS back pain (SMD: -0.41, 95% CI: -1.08 to 0.25, p=0.22) and VAS leg pain (SMD: 0.02, 95% CI: -0.31 to 0.34, p=0.92) were comparable between the two groups (Figure 2).

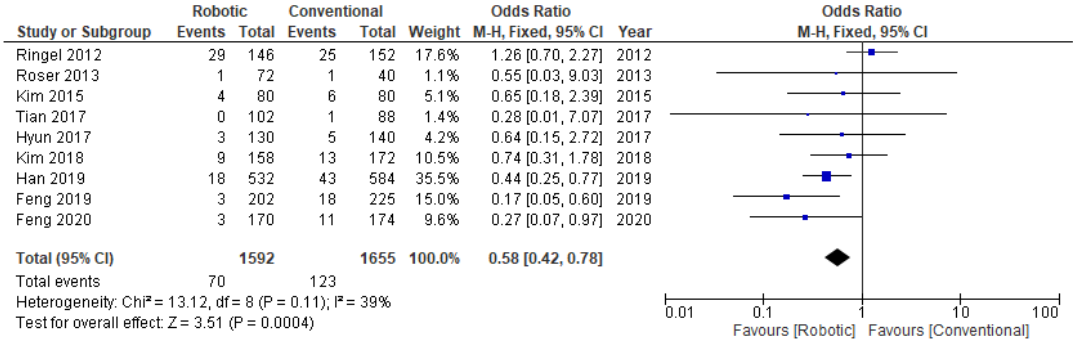
Conclusions: Compared with conventional lumbar spine pedicle screw placement, the robotic-assisted technique is a more accurate and safer alternative, with comparable clinical outcomes. The efficacy of the robotic-assisted technique is expected to improve further as experience with its use in spine surgery grows. To validate the beneficial role of robotics in spine surgery more RCTs with higher sample sizes are recommended.

References: 1. 2. Jutte PC, Castelein RM. Complications of pedicle screws in lumbar and lumbosacral fusions in 105 consecutive primary operations. Eur Spine J. 2002;11(6):594-598. Kosmopoulos V, Schizas C. Pedicle screw placement accuracy: a meta-analysis. Spine (Phila Pa 1976). 2007;32(3):E111-120.

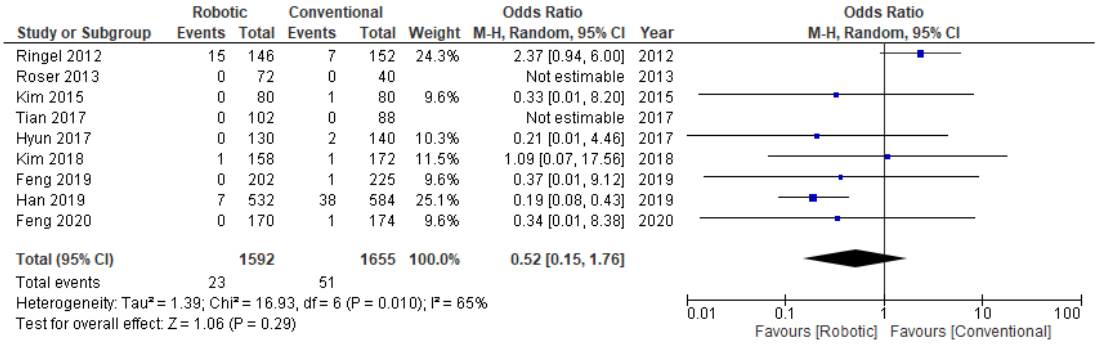
(A) Grade A Gertzbein-Robbins Score



(B) Grade B Gertzbein-Robbins Score



(C) Grade C+D+E Gertzbein-Robbins Score



(D) Proximal Facet Violation

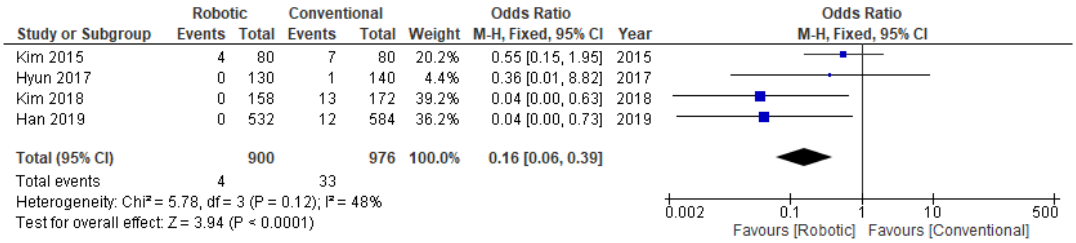
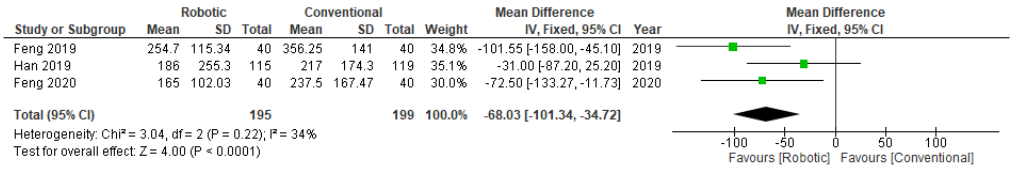
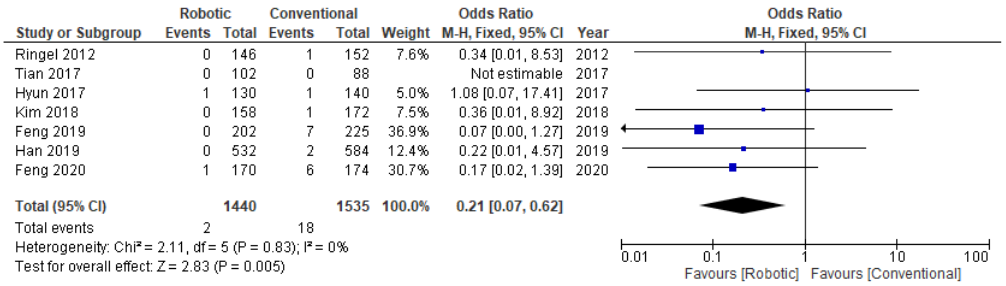


Figure 1. Forrest plots for accuracy of pedicle screw insertion for robotic-assisted versus conventional technique.

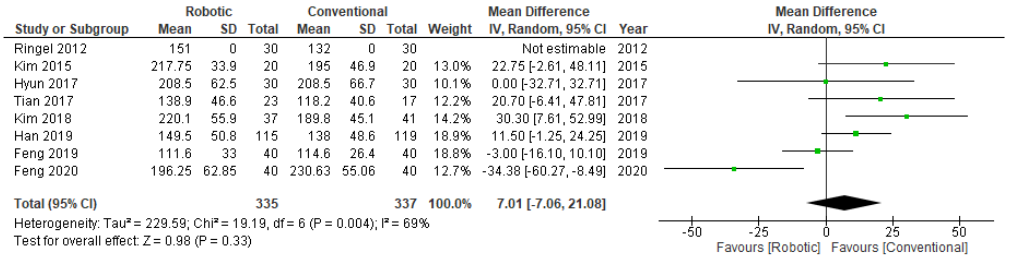
(A) Intraoperative Blood Loss



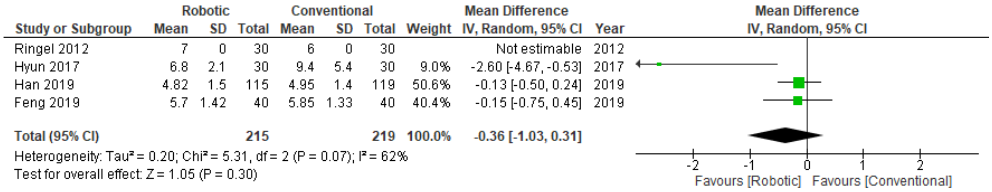
(B) Pedicle Screw Revision Rate



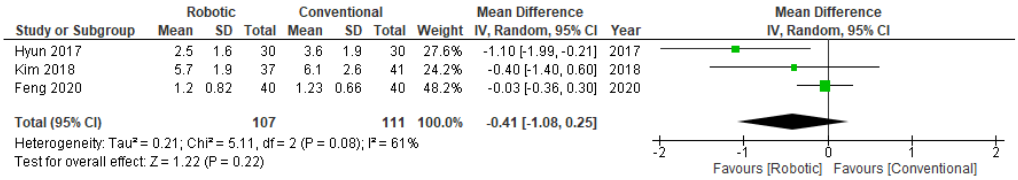
(C) Surgical Duration



(D) Length of Hospitalisation



(E) Final Postoperative VAS Back Pain



(F) Final Postoperative VAS Leg Pain

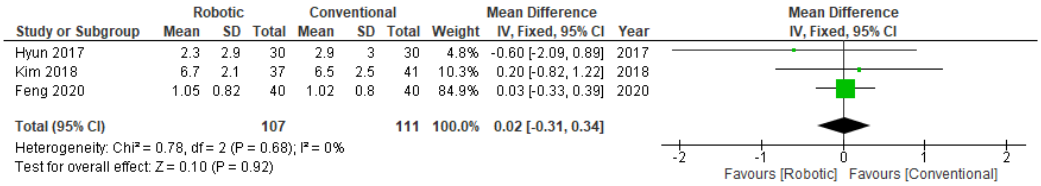


Figure 2. Forrest plots for intraoperative and postoperative clinical outcomes for robotic-assisted versus conventional technique.

3

Impact of Lateral Mass Fixation on axial Neck Pain and Quality of Life in Cervical Spondylotic Myelopathy: A 6 Month Retrospective Study at a Tertiary Hospital in Butwsal, Nepal

Khadka, Y, R.

Lumbini Provincial Hospital, Butwal, Lumbini Province, Nepal

Objective: The aim of this retrospective study was to assess the effects of lateral mass fixation surgery on axial neck pain and quality of life (QoL) in patients diagnosed with cervical spondylotic myelopathy (CSM). This study evaluates preoperative and postoperative changes in pain levels and functional outcomes over a 6-month period.

Methods: A total of 20 patients with CSM who underwent lateral mass fixation and laminectomy between November 2023 and April 2024 at a tertiary hospital in Butwal, Nepal, were included. Preoperative and 6-month postoperative data were obtained from patient records. Axial neck pain was measured using the Visual Analog Scale (VAS) and the Neck Disability Index (NDI). Quality of life was assessed using the Short Form-36 (SF-36). Neurological status was evaluated using the modified Japanese Orthopaedic Association (mJOA) score.

Results: At the 6-month follow-up, significant improvements were observed in both axial neck pain and quality of life. The mean VAS score decreased from 7.2 (preoperative) to 3.1 (postoperative) ($p<0.05$), and the mean NDI score improved from 40% to 22% ($p<0.05$) The SF-36 physical functioning score increased from 48 to 68 ($p<0.05$). Additionally, the mJOA score showed overall improvement, with 80% of patients demonstrating neurological recovery.

Conclusion: Lateral mass fixation for cervical spondylotic myelopathy significantly reduces axial neck pain and improves quality of life, particularly in physical function and pain management. These f indings suggest that lateral mass fixation is an effective treatment for improving both pain and functional outcomes in CSM patients. Further studies with larger sample sizes and longer follow-up periods are necessary to confirm these results and evaluate long-

term benefits. Keywords: Cervical spondylotic myelopathy, lateral mass fixation, axial neck pain, quality of life, retrospective study, Nepal, SF-36, NDI, EQ-5D.

4

Comparison of Topical Methylprednisolone 40 vs 80 MG on Postoperative Dysphagia after Multi level ACDF: A Randomized, Double-blinded, Controlled Trial

Natcha Chutchomchuen MD., Terdpong Tanaviriyachai MD.
Maharat Nakhon Ratchasima Hospital

Objectives: To compare the effectiveness of local intraoperative 40 vs 80 mg methypredsinolone (MPS) at decreasing the severity of swallowing difficulty following multilevel anterior cervical discectomy and fusion (ACDF).
Background: Dysphagia is a common complication after ACDF. While most patients experience minor and temporary symptoms, others may experience severe dysphagia that leads to considerable postoperative morbidity. There have been few prior research looking at the local use of corticosteroids.
Methods: This was a prospective, randomized, double-blinded, controlled trial of patients undergoing 2, 3, or 4-level ACDF for radiculopathy and/or myelopathy. Patients undergoing multilevel ACDF were randomized to receive the absorbable gelatin sponge mixed with MPS 40 mg (1 ml) + NSS 2 ml or the absorbable gelatin sponge + MPS 80 mg (2 ml) + NSS 1 ml in the retropharyngeal space. Dysphagia was assessed using validated outcomes, including the Eating Assessment Tool-10 (Eat-10) preoperatively and at 3 days (POD3), 14 days (POD14), and six weeks postoperatively. We also evaluated the neck disability index (NDI) and complications.
Results: Forty-nine patients had a complete dataset available for analysis. There were no statistically significant differences in Eat-10 scores between two groups on POD3 (3.04 vs. 4.33, P = 0.33), POD14 (2.64 vs. 2.08, P = 0.35), and six weeks postoperatively (1.16 vs. 1.45, P = 0.41). There were no statistically significant differences in VAS neck pain between two groups on POD3 (1.5 vs. 1.25, P = 0.16), POD14 (0.96 vs. 0.79, P = 0.28), and six weeks postoperatively (0.36 vs. 0.54, P = 0.13). There were no statistical differences in NDI between the two groups on POD3 (18.62 vs. 15.41, P = 0.10) and six weeks postoperatively (7.00 vs. 6.20, P = 0.34). There were no reported cases of postoperative infection in both groups.
Conclusions: Higher methylprednisolone dose after multilevel ACDF did not significantly reduce postoperative dysphagia severity and symptomatology from the immediate postoperative period to six weeks postoperatively. Thus, we recommend using the topical administration of 40 mg MPS for postoperative dysphagia sufficiently.

5

Posterior only Instrumentation without Fusion in Thoracolumbar Burst Fractures

Sharma BD1, Dawadi TP1
1Department of Orthopaedics, Chitwan Medical College, Bharatpur, Nepal

Introduction: Thoracolumbar fractures are the most common region to be involved in spinal trauma. Burst fractures in this transition zone are often unstable and can affect the neurology requiring surgery. Recent trend is towards short segment posterior instrumentation to preserve spinal motion. This study aims to evaluate the functional and radiological outcomes of short segment posterior instrumentation without fusion in thoracolumbar burst fractures in our setting.
Materials and methods: This was a prospective study conducted at Chitwan Medical College from July 2021 to June 2023 after ethical approval and included 45 patients aged >18 years having burst fracture of the thoracolumbar junction (T10 to L2) who consented to participate in the study. Those with multi-level spinal injuries, osteoporotic or metastatic fractures, polytrauma or previous trauma at thoracolumbar area were excluded. Short segment posterior instrumentation one level above and below including one or both pedicles of the affected vertebra was done with no further attempt for fusion. Patients were followed-up for a year and clinically evaluated with Visual Analogue Scale and Smiley-Webster Scale, and radiologically with anterior body height ratio and kyphotic angle. Data analysis was done using Statistical Package for Social Sciences (SPSS) version 16.0 and p- value <0.05 was considered significant.
Results: There were 29(64.44%) males and 16(35.56%) females with the mean age of 45.38±15.68 years. Majority fell from height 30(66.67%) and involved L1 vertebra 18(40%) with AO A3 fractures 18(40%) and A4 27(60%). Preoperative mean anterior body height ratio of 0.49±0.15 improved to 0.91±0.08 postoperatively and kyphotic angle of 23.670±5.510 improved to 4.850±2.870 (p<0.001) On subsequent follow-ups, there was some loss of correction in body height ratio (0.08±0.04) and kyphotic angle (1.950±1.820), but they remained statistically significantly improved when compared to preoperative values. Visual Analogue Score of 4.87±1.11 during discharge improved to 0.82±0.94 at final follow-up (p<0.001) and the Smiley Webster Scale was excellent in 22(48.89%) and good in 16(35.56%) patients. The overall complication rate was 6(13.33%).
Conclusion: In thoracolumbar burst fractures, short segment posterior instrumentation including the fractured vertebra without fusion provides adequate fixation with good functional outcomes. Keywords: Burst, fusion, posterior stabilization, short segment, thoracolumbar

6

The Impact of "Keyhole" when Discussing Spine Surgery – A Deep Dive into Patients' Perception of Minimally Invasive Spine Surgery

Chen JYS1, Seah AMJ1, Oh JYL1, Leyu CGY2, Loh MWP3
1Department of Orthopedics, Tan Tock Seng Hospital
2Yong Loo Lin School of Medicine, National University of Singapore
3Lee Kong Chian School of Medicine, Nanyang Technological University

Introduction: Patient perspectives on spine surgery remain underexplored, particularly their preferences regarding minimally invasive techniques. This study aims to evaluate the impact of "keyhole" on patient awareness, perceptions, and demand for Minimally Invasive Spine Surgery (MISS).
Methods: A cross-sectional survey was conducted from June to November 2024 in Tan Tock Seng Hospital. Patients completed an anonymous 30-question questionnaire addressing their understanding of spine surgery, perceptions of "keyhole" surgery and techniques, and willingness to opt for MISS under varying circumstances. This study included symptomatic participants with degenerative lumbar pathologies for lumbar decompression and fusion surgery. Cervical pathologies, or lumbar pathologies secondary to trauma, infection, inflammation or tumors were excluded.
Results: A total of 50 patients participated (mean age: 54 years; 56% female). Most patients (80%) perceived spine surgery as high-risk, with top concerns including complications (70%) and poor outcomes (50%). Yet, more patients view "keyhole" surgery as a minor surgery (44%) than a major surgery (18%), with 74% believing most-to-all patients are suitable candidates. 92% will choose "keyhole" surgery over open surgery, citing lower complication risks (62%) and better outcomes (50%) as primary reasons. More than 50% of patients are willing to wait longer, pay more, and travel further for MISS. Despite this preference, 63% would defer to their surgeon's recommendation if MISS was not advised. However, only 60% of patients were aware that "keyhole" surgery referred to MISS, tubular or endoscopic surgery. Almost all patients (88%) were unaware of the difference between endoscopic, tubular and MISS.

Discussion: The term “keyhole” heavily influences patients’ interest in spine surgery, even amongst those with limited knowledge of MISS. Despite majority deeming spine surgery high-risk, almost 50% regard “keyhole” as a minor surgery and over 50% believe majority-to-all patients are suitable candidates. Patients perceive MISS as safer and more effective than open surgery but often underestimate its complexity and limitations. These findings underscore the importance of patient education and the surgeon’s role in aligning expectations with clinical realities through shared decision-making. A surprising majority of patient opting for open spine surgery if MISS is deemed inappropriate emphasizes open surgery’s continued relevance, although the integration of robotic assistance in MISS opens a new frontier to address a growing demand for MISS across a wider range of spine pathologies.
Conclusion: This study underscores the strong patient preference for MISS and the impact “keyhole” has on patient perception, emphasizing the need for evidence-based patient education to address misconceptions and align expectations, fostering trust and satisfaction in the advancement of MISS.

7

The Utility of MRI for Spinal Clearance in Blunt Trauma: A Study in a Level 1 Trauma Center in Singapore

HENG WT1,, TAN JHJ1, TAN WPJ1, CHAN CXY1, MENON KR 2
1 Division of Orthopaedic Surgery, National University Hospital, Singapore
2 Division of General Surgery (Trauma), Department of Surgery, National University Hospital, Singapore

Introduction / Objectives: The majority of spinal injuries occur secondary to blunt trauma and patients withsignificant blunt trauma must be assumed to have an unstable spinal injury. MRI scans are highly sensitive but can be logistically difficult to perform in ICU patients and may prolong duration of spinal immobilization unnecessarily. In this preliminary study we investigated the efficacy of MRI scans in changing patient management in blunt trauma patients with and without indications for MRI scans.
Materials and Methods: This is a retrospective study of patients with significant blunt trauma who had MRI of the spine performed between Jan -Dec 2023 in the National University Hospital, Singapore. Indications for an MRI spine include potentially unstable spinal fractures on CT scan, ambiguous findings on CT scans, neurological deficits and ankylosing conditions of the spine. Significant blunt trauma is defined as per the Canadian C spine Rule criteria. Fracture morphology stability was based on the AO spine fracture classifications. Outcomes studied included duration of spinal immobilisation and change in patient management post MRI.
Results /Discussion: 70 patients (57(81.4%) male and 13(18.6%) female) were identified of these 39(55.7%) received an indicated MRI and 31(44.3%) received an unindicated MRI. In the first group, the most common indications for MRI were, potentially unstable fractures (30 (76.9%) patients) and neurological deficits (26 (66.7$) patients). 28/39(71.8%) of the first group of patients had MRI findings which led to a decision for surgical management of their spinal injuries. In the second group of patients the presence of stable spinal fractures (19 (61.3%)patients), inability to perform neurological examination (7 (22.4%)patients and spinal tenderness (5(16.1%)patients) were the main indications for MRI. Only 1(3.2%) patient had an MRI finding (brachial plexus injury) which led to a significant change in management). Mean additional duration of spinal nursing was 3.4 range (0-9) days in the second group.
Conclusion: In blunt trauma patients with no clear indication for MRI, an additional MRI scan may lead to unnecessary prolongation of spinal nursing with no additional benefit to the patient. Further study in the additional costs and medical complications associated with un-indicated MRI scans are warranted.

8

Robot Assisted Navigation Guided Percutaneous Thoracolumbar Fracture Fixation in Neurologically Intact Individuals

Manghwani J, Ganesh K
Indian Spinal Injuries Center, New Delhi, India.

Background: Unstable thoracolumbar burst fractures in patients mainly present as instability, involving all three columns of the spine, and surgical intervention is often considered necessary. However, in unstable fractures, the significant alterations in bony structure and anatomy result in a lack of identifiable landmarks, along with the possible movement of fracture fragments can increase the difficulty of pedicle screw implantation. Therefore, we present the clinical outcomes of robotic-assisted percutaneous fixation for unstable thoracolumbar fractures.
Methods: A retrospective review was conducted on a series of patients with unstable thoracolumbar fractures. All patients sustained thoracolumbar fractures between June 2019 and December 2022 and underwent posterior robotic-assisted percutaneous fixation procedures. Outcomes of interest included operative time, intra-operative blood loss, complications, duration of hospital stay. The complications between trainee and experienced surgeon were studied. The clinical outcomes were assessed using the visual analogue scale (VAS) and Oswestry Disability Index (ODI).
Results: The patients had a mean age of 57.2 ± 13.0 years and a mean follow-up duration of 12.7 ± 18.9 months. Mean hospital stay duration was 03 ± 8.0 days. The mean operative time was 96.6 ± 42.2 min, and the median blood loss was 120±112 ml. The VAS value improved from 6.8 ± 0.9 preoperatively to 1.3 ± 1.0 at the final follow-up ($P < 0.05$). The ODI value improved from 83.6 ± 6.1% preoperatively to 11.8 ± 6.6% at the latest follow-up ($P < 0.05$). Of the 656 screws implanted, 7 (1.4%) were improperly positioned. One patient experienced delayed nerve injury after the operation, but the nerve function returned to normal upon discharge. No statistical difference in errors between surgeons with different level of expertise.
Conclusion: Posterior robotic-assisted percutaneous internal fixation can be used as an ideal surgical treatment for unstable thoracolumbar fractures.

9

Filling the Gap in the Global Alignment and Proportion Score in Adult Spinal Deformity Surgery – A 5-year Follow-up Study

Manghwani J, Ganesh K
Indian Spinal Injuries Center, New Delhi, India.

Background: We aimed to validate the global alignment proportion (GAP) score in addition to other preoperative parameters in patients undergoing surgery for adult spinal deformity (ASD).
Study design: Retrospective analysis with prospective follow-up.
Materials and methods: A total of 93 patients who underwent surgery for ASD from 2017 to 2022 were enrolled. Using early postoperative X-ray, they were divided into proportioned (P), moderately proportioned (MP), and severely proportioned (SP) groups based on GAP score. Further, they were classified into two groups: Group A (presence of mechanical complications) and group B (no complications). In addition, other parameters including preoperative BMI, smoking status, cross-sectional area (CSA), and fatty infiltration (FI) of paraspinal muscles were calculated in all patients using preoperative MRI. These parameters were compared across the groups using a one-way analysis of variance (ANOVA). Post-hoc pairwise testing was done using Bonferroni's method. These were also compared between groups A and B using a 2-sample t-test.
Results: The mean follow-up period was 32.7 months (24-64 months). 27 (29%) of 93 patients developed mechanical complications following ASD surgery. Of the 27 patients, 6 (22.2%) were proportioned, 10 (37%) were from MP and 11 (40.7%) were from the SP group. Group A had low CSA ($p=0.014$), and high FI ($p=0.003$) compared to group B. Further, 22.2% (6/27) had a history of smoking before surgery.

Conclusions: We recommend consideration of preoperative smoking, CSA, and FI of paraspinal muscles in addition to the GAP score to minimise mechanical complications in patients undergoing ASD surgery.

10

Thoracic Posterior Dynamic Deformity Correction (PDDC) is Better than Lumbar PDDC for Growth Modulation in Adolescent Idiopathic Scoliosis (AIS)

Poon G1, Tan JH1, Liu GKP1
1: Department of Orthopaedic Surgery, National University Hospital, Singapore

Introduction/Objectives: The concept of internal bracing using anterior vertebral tethering to achieve growth modulation has been well reported. However few publications describe the use of posterior dynamic deformity correction (PDDC) devices in the treatment of scoliosis of growing spines. This study aims to examine the outcomes of a PDDC with attention to comparing thoracic versus lumbar curves.

Materials and Methods: A retrospective review of all PDDC from December 2017 – June 2023 was performed. Patient demographics, clinical, surgical, radiological and post operative data were collected.

Results/Discussion: A total of 18 patients were included with a follow up of 31 ± 19 months. Mean age was 12.9 ± 1.5 years, mean Risser was grade 1 to 2± 1. 11 patients with Lenke 1&2 curves underwent instrumentation over 8.6 ± 0.5 levels. Mean pre-operative structural thoracic curve was 48 ± 6 0, which was corrected to 18 ± 9 0 (63 ± 18 % correction). Compensatory lumbar curve was 32 ± 10 0 which spontaneously corrected to 17 ± 100 (47 ± 16 % correction). 7 patients with Lenke 5 curves underwent instrumentation over an average of 6.8 ±0.7 levels. Mean pre-operative structural lumbar curve was 50 ± 90, which corrected to 21 ± 9 0(58 ± 17 % correction) post-operatively . Compensatory thoracic curve was 31 ± 160 which spontaneously corrected to 23 ± 5.0 (30 ± 25 % correction). There was no difference in operative time, length or stay or blood loss. Both groups reported no pain on follow ups. At final follow up Lenke 1 patients had an increase in main thoracic curve by 7 ± 10 0 and an increase in compensatory lumbar curve by 1 ± 8 0. Lenke 5 patients had an increase in main lumbar curve by 20 ±170 and an increase in compensatory curve by 15 ± 100. 6 lumbar(85.7%) patients underwent revision surgery. The average onset of correction loss was 31.8± 18.5 months. Most common mode of failure was rachet system failure which occurred in all but one lumbar PDDC. Multivariate analysis confirmed Lenke 5 curve is a significant risk factor for revision(p=0.05). There were no neurological deficits or infections in all patients. Despite the high incidence of correction failure in lumbar PDDC there was no significant difference in post operative SRS-22r, SF 36 and EQ5D scores between the thoracic and lumbar groups.

Conclusion: The PDDC is shown to achieve reliable curve correction in thoracic curve patients and may be a good alternative to traditional fusion and other growth modulation techniques. However, lumbar curves which underwent dynamic posterior instrumentation are at high risk of failure.

11

Carbon-fiber Reinforced Polyetheretherketone (CFR-PEEK) Instrumentation in Metastatic Spine Tumour Surgery: Technical Pearls and Potential Pitfalls to Avoid

Study Design: Narrative Review

Background: Carbon-fiber reinforced Polyetheretherketone (CFR-PEEK) instrumentation has been described in recent years for use in MSTS. Benefits of CFR-PEEK include reduction of imaging artifacts, allowing for more efficient follow-up and adjuvant radiotherapy planning as compared to traditional titanium implants. Despite the increase in CFR-PEEK usage in literature, there is currently no technical guide or considerations in terms of usage of CFR-PEEK in MSTS. We aim to highlight various important technical considerations and potential pitfalls for surgeons when utilising CFR-PEEK instrumentation in MSTS.

Methods: This narrative review was conducted using PubMed, Medical Literature Analysis and Retrieval System Online (MEDLINE), The Cochrane Library and Scopus databases through 30 September 2024. All studies that were related to CFR-PEEK instrumentation in MSTS were included. The vast personal experiences of the senior authors with CFR-PEEK instrumentation also circumstantiated the concepts highlighted in this paper.

Results: A total of 30 studies were included in this review. We discussed various considerations when planning for CFR-PEEK instrumentation in MSTS patients. These factors include pre-operative construct planning, intra-operative handling of the CFR-PEEK system, as well as post-operative considerations such as requirement for radiotherapy (RT) planning.

Conclusion: In our manuscript, we are the first to highlight various considerations for MSTS surgeons to take into account when utilising CFR-PEEK instrumentation. This serves as an important guide for surgeons treating MSTS, with the continuous evolvement of our treatment capacity in MSD.

Level of Evidence IV

Keywords: Carbon-Fiber, PEEK, Spine, Tumour, Implant, Instrumentation, MIS, Radiolucency, Radiation Planning, Imaging, Imaging Artifacts, Local Tumour Control, Local Tumour Recurrence

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Shaping the Future of Blood Management in Metastatic Spine Tumour Surgery: The Case for Cell-salvaged Transfusion with a Propensity Matched Study

Purpose: Blood loss is an important consideration in metastatic spine tumour surgery (MSTS). Allogeneic blood transfusion (ABT) is the current standard of blood replenishment for MSTS despite known complications. Salvaged blood transfusion (SBT) through intraoperative cell salvage (IOCS) addresses majority of complications related to ABT. However, use of SBT in MSTS remains controversial. We conducted a prospective propensity-score (PS) matched analysis to evaluate the long-term clinical outcomes of IOCS in MSTS.

Methods: Patients who underwent MSTS from 2014-2017 were included. PS matched cohort was created using the relevant and available predictors of treatment assignment and outcomes of interest. Clinical outcomes consisting of overall survival (OS), as well tumour progression (TP) that was evaluated using RECIST (v1.1) were analysed.

Results: Our study included 98 patients with a mean age of 60yrs. 33 patients received SBT, 39 received ABT and 29 received NBT. Median blood loss was 400 mL [IQR 200-900 mL] and median BT was 328.5 mL (IQR: 0 – 1042 mL). Group PS matching included 30 patients who received ABT and 28 patients who received SBT. There was also no significant difference between the OS of patients who underwent ABT or SBT (p=0.250). SBT did not show any significant increase in 4-year tumour progression (p=0.908).

Conclusion: SBT has shown to have similar clinical outcomes to that of ABT in patients undergoing MSTS, with benefits of avoiding complications of ABT. This is the first long term PS matched analysis reporting clinical outcomes of SBT, affirming its role in MSTS today.

Keywords: Metastatic spine tumour surgery, Salvaged blood, Blood transfusion, Allogenic blood, Intraoperative cell salvage

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Does Salvaged Blood Transfusion reduce Allogenic Blood use in Metastatic Spine Tumour Surgery? A Prospective Comparative Study

Background: Blood loss is an important consideration in metastatic spine tumour surgery (MSTS). Allogeneic blood transfusion (ABT) is the current standard of blood replenishment for MSTS despite known complications. Salvaged blood transfusion (SBT) through intraoperative cell salvage (IOCS) has shown to have similar outcomes as ABT and addresses majority of complications related to ABT. We conducted a prospective study to evaluate the impact of salvaged blood transfusion use on allogenic blood transfusion requirement peri-operatively.

Methods: Patients who underwent MSTS from 2014-2017 were included. Patients were divided into three groups based on their BT type: no blood transfusion (NBT), ABT and SBT. Clinical outcomes consisting of peri-operative blood loss and amount of blood transfusion (salvaged or allogenic) were included. Patients were followed-up for 4 years or till death, whichever was earlier.

Results: Our study included 98 patients with a mean age of 60 years old. 33 patients received SBT, 39 received ABT and 26 received NBT. Median blood loss was 500mL for the ABT group and median blood loss was 700mL for the SBT group. Mean blood transfused was 600mL for the ABT group and 705mL for the SBT group. Median amount of allogenic blood transfused was 600mL for the ABT group and 300mL for the SBT group. Intra-operatively, the median amount of salvaged blood transfused was 350mL. The SBT group had a median reduction of 300mL of ABT required perioperatively. Pre-operative hemoglobin was similar throughout the groups.

Conclusion: SBT has shown to effectively reduce the amount of ABT required peri-operatively for MSTS patients, on average saving up to 1 unit of blood per patient. This is the first long term study in MSTS that directly analyses the impact of SBT on ABT requirement, affirming its role in MSTS and perioperative patient blood management strategies.

Keywords: Metastatic spine tumour surgery, Salvaged blood, Blood transfusion, Allogenic blood, Intraoperative cell salvage

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Accuracy of Postero-superior Iliac Spine Reference Array Placement in Robot-navigated Spine Surgery

Joseph WAN1, Qing Hang TAN1, Dalun LEONG1, Zhihong CHEW1, Terry Hong Lee TEO1

1 Department of Orthopaedic Surgery, Changi General Hospital, Singapore

Background: Computer-navigated spinal instrumentation requires placement of a dynamic reference base (DRB), typically intraosseously in the ilium via a percutaneous stab incision on the posterior superior iliac spine (PSIS) entry point. Data describing the accuracy and complications of DRB placement is limited in literature. The aim of this study is to measure the accuracy of DRB placement in the PSIS, determine its exact placement trajectory and determine the prevalence of related complications.

Methods: Single-centre, institutional board approved, multi-surgeon retrospective analysis of 69 included DRB placements from 51 robot-assisted lumbar posterior instrumentation procedures. Pin entry point and trajectory were mapped out the intra-operative O-arm computed tomography scans, and skin-to-PSIS depth was also measured. Patient demographics (age, gender, BMI), surgical outcomes and post-operative complications are also recorded.

Results: Of the 69 PSIS pin placement, 47 (68.1%) had the correct entry point on the PSIS, and 35 (50.7%) of them were placed correctly within the ilium without breaching a second cortex. Skin-to-PSIS depth was significantly higher in patients with misplaced DRB placement, while age, gender and BMI were similar. Of those with misplaced DRB (n= 34), 1 had delayed pin site wound healing.

Conclusion: Percutaneous PSIS DRB placement has poor accuracy, with skin-to-PSIS depth being a significant factor. To avoid complications from misplaced DRB placement, the authors recommend the use DRB placement on the iliac wing or on the PSIS following the trajectory used in pelvis posterior column fracture fixation, using fluoroscopy intra-operatively to ensure the DRB pin position.

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Comparative Cost-effectiveness and Surgical Technique Comparative Analysis between two Robot-assisted Platforms in Minimally Invasive Transforaminal Interbody Fusion (MIS-TLIF)

Joseph Wan1, Tay Zhi Quan1, Shane Zaw2, Chew Zhihong1, Shree Kumar Dinesh1

1 Department of Orthopaedic Surgery, Changi General Hospital, Singapore

2 Department of Neurosurgery, Changi General Hospital, Singapore

Background: The use of robotics is increasingly studied in spinal surgery, reporting improved accuracy of instrumentation, smaller incisions, with reduced surgeon fatigue and radiation exposure. Many robot platforms exists on the market with different workflows, translating to different technical challenges and learning curve for the surgical team to overcome.

Objective: This study aims to compares cost effectiveness and patient outcomes of robot-assisted minimally invasive transforaminal lumbar interbody fusion (RA-TLIF) on the two platforms used in our institution (ExcelsiusGPS™ and Mazor™ X Stealth Edition). Methods Single-centre, retrospective case cohort series of 49 and 27 patients who underwent elective RA-TLIF on the ExcelsiusGPS™ and Mazor™ X Stealth Edition platforms respectively. A separate age-matched and level-matched control group of patients who underwent conventional O-arm navigated free-hand minimally invasive transforaminal lumbar interbody fusion (ON-TLIF) was also collected (n = 50). Patient demographics (age, gender, Charlson Co-morbidity Index (CCI), BMI) and post-operative outcomes were used in comparative analysis.

Results: No significant differences were found in patient baseline demographics, CCI, operative duration, length of inpatient stay, post-operative ambulation. Rates of intra-operative and post-operative complications were similar across all 3 groups. However, surgical implant and consumable costs were significantly lower in the ExcelsiusGPS™ RA-TLIF group ($p<0.001$).

Conclusion: While the ExcelsiusGPS™ RA-TLIF group has the lowest surgical costs, this study shown similar patient outcomes, surgical duration, length of hospital stay and complication rates in the RA-TLIF groups when compared to the control ON-TLIF group. Having experienced both platforms, the authors feel the ExcelsiusGPS™ holds greater ease in its workflow with reduced steps during the pre-operative set-up, and its rigid robotic arm can reduce the risk of instrument skiving and enhance accuracy.

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Complication Rates in AIS Patients with COBB Angle ≥ 70°: A Comparative Analysis of Surgical Approaches

Leyu C1, Neo BXB1, Tan JH2, Chew J2 Sim S2, Liu G2

1National University of Singapore, Yong Loo Lin School of Medicine

2National University Hospital, Department of Orthopaedic Surgery

Introduction: Surgical management of Adolescent Idiopathic Scoliosis (AIS) with a Cobb angle ≥ 70° is challenging. Current surgical treatment strategies include: Anterior release combined with Posterior Ponte osteotomy (APO), Posterior approach with Ponte osteotomy (PO), or a Posterior-only approach

(P). However, the post-operative complications vary depending on the surgical strategy employed. This study aims to report the complication rates amongst patients with Cobb angle ≥ 70° who underwent either APO, PO, or P surgery.

Methodology: A retrospective cohort study was conducted on AIS patients with a 70°–100° major structural curve who underwent deformity correction at a single university hospital. Patients were categorized into APO, PO, and P surgical approach groups. Demographic, radiological, perioperative, and outcome data were analysed. The mean follow-up was 31.5 ± 28.0 months.

Results: This study included 94 patients. The mean age was 14.7 ± 3.2 years, with 79 females (84.0%). The mean BMI was 19.2 ± 4.9, and the median Risser stage was 4. The most common curve pattern was Lenke 2 (34.7%), followed by Lenke 6 (17.9%). The mean magnitude of the major structural curve was 74.6 ± 9.8°, with a curve flexibility of 35.5 ± 16.0%. The mean follow-up was 31.4 ± 28.0 months. The overall complication rate was 14.9% (14 patients). The medical complications rate was 6.38% (6 patients), with the majority being post-operative ileus (5/6 patients), All patients with post-operative ileus were treated conservatively and fully recovered. One patient had superior mesenteric artery syndrome post-operatively, which resolved after conservative treatment. 8 patients (8.51%) had surgical complications. Four patients had superficial surgical site infections, which resolved with antibiotics. Three patients (37.5%) experienced distal adding-on, of which 1 required revision surgery. The overall revision rate was 1.1% (1/94). No patients experienced neurological deficits. Subgroup analysis showed that patients who underwent APO had an overall complication rate of 13.6% (3/22 patients), consisting of 2 surgical and 1 medical complications. Patients who underwent the PO approach had an overall complication rate of 18% (9/50 patients), consisting of 4 surgical and 5 medical complications. Patients who underwent the P approach had an overall complication rate of 9.09% (2/22 patients), both of which were surgical complications.

Conclusion: AIS patients with a large curve of > Cobb 700 had an overall complication rate of 14.9%, and a revision rate of 1.1%. Of this, 42.8% were medical complications, and 57.1% were surgical complications. Patients who underwent PO approach that slightly higher complication rate as compared to APO and P groups, although most resolved with conservative treatment.

Type of Surgical Approach	Anterior + Posterior + Osteotomy (APO)		Posterior + Osteotomy (PO)		Posterior Only (P)	
Total Number of Complications	3/22		9/50		2/22	
	Medical complications	Surgical complications	Medical complications	Surgical complications	Medical complications	Surgical complications
Number of Complications	1	2	5	4	0	2
Complications Breakdown (No. of Patients)	- Post-operative ileus (1)	- Curve progression & Increased rib hump post-op (1) - Distal adding on, revision surgery required (1)	- Post-operative ileus (4) - Superior Mesenteric Artery Syndrome (1)	- Superficial skin infection (3) - Distal adding (1)		-Superficial skin infection -Distal adding on

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Pearls amd Pitfalls of Endoscopic Spine Surgery in spinal Metastasis: A Systematic Review

Suvithayasiri S.1,2, Boonsirikamchai W.3,4, Chavalparit P.3,5, Santipas B.3,6, Liu Y.3, Kim J.S.3* 1.

Department of Orthopedics, Chulabhorn Hospital, Chulabhorn Royal Academy, Bangkok, Thailand. 2. Bone and Joint Excellence Center, Thonburi Hospital, Bangkok, Thailand. 3. Department of Neurosurgery, Seoul St. Mary's Hospital, College of Medicine, The Catholic University of Korea, Seoul, South Korea. 4. Department of Orthopedics, Bhumibol Adulyadej Hospital, Bangkok, Thailand. 5. Department of Orthopedics, Vajira Hospital, Navamindradhiraj University, Bangkok, Thailand. 6. Department of Orthopaedic Surgery, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand.

Introduction / Objectives: Spinal metastasis is an increasing clinical challenge that call for innovative, less invasive treatment strategies. This systematic review evaluates endoscopic spine surgery (ESS) as a minimally invasive alternative for managing spinal metastasis, with a focus on its efficacy in neural decompression and separation surgery while reducing tissue trauma and perioperative morbidity.

Materials and Methods: A comprehensive literature search was conducted in accordance with PRISMA guidelines, screening multiple databases for studies on ESS in spinal metastasis. Studies employing uniportal and biportal endoscopic techniques were included, while strict exclusion criteria ensured methodological rigor. Data extraction concentrated on surgical outcomes, patient selection criteria, technical nuances, and complication profiles, with quality assessments performed using an adapted GRADE framework.

Results / Discussion: Of 133 abstracts screened, 11 studies met the inclusion criteria. These studies highlighted both uniportal and biportal spinal endoscopy across cervical, thoracic, and lumbar regions. The synthesis of available literature indicates that ESS offers significant clinical benefits, including reduced operative blood loss, minimized soft tissue disruption, and accelerated patient recovery. Outcomes comparable to traditional open surgery were observed, with a notably lower complication rate. Nevertheless, challenges remain—such as a steep learning curve, limited instrument maneuverability, and difficulties in achieving optimal hemostasis—which underscore the importance of careful patient selection and specialized surgical expertise.

Conclusion: In conclusion, ESS appears to be a promising, minimally invasive option for treating spinal metastasis in well-selected patients. Its advantages of reduced morbidity and faster recovery support its potential integration into modern surgical practice. Future studies with rigorous methodologies are warranted to refine technical protocols and standardize patient selection criteria, thereby ensuring consistent and optimal outcomes in this complex clinical setting.

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Endoscopic-assisted Retroperitoneal Approach for the Devastating Spondylodiscitis with Psoas Abscess

Suvithayasiri S.1,2, Park C.W.2, Liu Y.2, Jitpakdee K.3, Mahatthanatrakul A.4, Kim J.S.2 1.
Bone and Joint Excellence Center, Thonburi Hospital, Bangkok, Thailand. 2. Department of Neurosurgery, Seoul St. Mary's Hospital, College of Medicine, The Catholic University of Korea, Seoul, South Korea. 3. Department of Orthopedics, Queen Savang Vadhana Memorial Hospital, Chonburi, Thailand. 4. Department of Orthopedics, Naresuan University Hospital, Phitsanulok, Thailand.

Introduction/Objectives: This retrospective study assesses the use of an endoscopic-assisted retroperitoneal approach for treating spondylodiscitis with psoas abscess. This condition often needs long-term antibiotics and possibly surgery, which is typically challenging, especially in frail patients with several health issues. While traditional surgical approaches can be risky and harmful, the use of our ultra-minimally invasive endoscopic-assisted methods could reduce surgical harm and improve outcomes, offering a promising alternative for this complex condition.

Material and Methods: We systematically analyzed case series data from patients treated between 2013-2023 for psoas abscess using an endoscopic-assisted retroperitoneal approach. Outcomes were gauged through pain rating scales, spinal injury assessments, time to normalize lab markers, and 6-month postoperative patient satisfaction scores. Results: From 81 patients with spinal infections who had been surgically treated in our hospital, nine patients (mean age 65.67 ± 10.6 years) with various co-morbidities were included. Spinal stabilization was conducted in 7 cases. Average operative time and blood loss were 149.44 ± 63.05 minutes and 88.89 ± 117.59 mL, respectively. Postoperative pain reduction was significant, with 88.89% maintaining or improving their spinal injury scores a year after surgery. Lab markers normalized within a week to a month for most patients, and 77.78% reported good to excellent satisfaction scores 6 months post-surgery.

Conclusion: This endoscopic-assisted retroperitoneal approach demonstrates promise for managing spondylodiscitis associated with psoas abscess, with encouraging patient outcomes and experiences reported in our series. This minimally invasive technique, offering reduced tissue damage and potential for quicker recovery, may particularly benefit frail patients with multiple co-morbidities.

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Trends in Spinal Decompression Surgery in Sengkang General Hospital: A Descriptive Observation Study

Lee KL[1], Gengatharan D[2], Thng JWC[1], Chau D[2], Neo GH[2], Huang YL[2]
1Department of Orthopaedic Surgery, Yong Loo Lin School of Medicine, National University of Singapore, Singapore
2Division of Spine Surgery, Department of Orthopaedic Surgery, Sengkang General Hospital, Singhealth Health Services, Singapore

Introduction: Spinal stenosis and degenerative spinal conditions are increasingly prevalent, significantly impacting patients' quality of life. Spinal decompression surgery, including open and endoscopic techniques, is an essential treatment for this condition. This study aims to describe trends in spinal decompression surgery at a tertiary teaching hospital in Singapore, focusing on changes in surgical volume, operative time, patient demographics, pathology, surgical techniques, and follow-up outcomes.

Methods: A retrospective observational study was conducted on 588 patients who underwent spinal decompression surgery between 2021 and 2024. Data collected included patient demographics, level of pathology, anatomical distribution, surgical techniques, and postoperative outcomes. The number of cases per surgeon per year was evaluated to assess workload distribution and demand. Additionally, mean operative times for single-level decompression cases and frequency of different techniques were used to identify trends in surgical efficiency.

Results and Discussion: The number of spinal decompression surgeries increased from 56 in 2021 to 217 in 2024, with a shift towards endoscopic procedures, rising from 0 in 2021 to 202 in 2024. Correspondingly, the number of open procedures declined from 56 in 2021 to 15 in 2024. Despite the increase in surgical volume, the number of surgeons performing these procedures remained at 6, resulting in a higher caseload per surgeon. The mean operative time for single-level decompression cases exhibited variations across the years, from 152 to 159 minutes. Non-elective cases had a longer mean operative time of 189 minutes compared to elective cases. Most patients (538/588, 92%) had lumbosacral pathology, while cervical and thoracic pathology were less common. Most procedures were elective (539/588, 92%). Among the 556 patients with documented follow-up for symptom recurrence, 546 (98%) had mild symptoms to complete symptom resolution, 2 (0.4%) had moderate symptom recurrence tolerable requiring conservative treatment, 2 (0.4%) had severe intolerable symptom recurrence requiring a revision surgery, 6 (1%) developed new onset of symptoms discrete from previous pathology levels affected.

Conclusion: This study highlights the increasing adoption of endoscopic spinal decompression as a preferred surgical approach in spinal stenosis. The shift towards minimally invasive techniques appears to be associated with favourable patient outcomes, including high rates of symptom improvement and low complication rates. However, the presence of a subset of patients who do not achieve full symptom relief or require revision surgery suggests the need for further investigation into factors influencing surgical success. Future research with long-term follow-up is needed to further assess the durability and comparative efficacy of different surgical methods.

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Titanium (TI) Cages may be Superior to Polyetheretherketone (Peek) Cages in Lumbar Interbody Fusion: A Systematic Review and Meta-analysis of Clinical and Radiological Outcomes of Spinal Interbody Fusion using TI versus Peek Cages

Leyu C1, Neo BXB1, Liu G2, Sim S2, Tan JH2
1National University of Singapore, Yong Loo Lin School of Medicine
2National University Hospital, Department of Orthopaedic Surgery

Introduction: Lumbar interbody fusion is a common surgical approach for treating various spinal disorders. Titanium (Ti) and polyetheretherketone (PEEK) cages are widely used as interbody spacers, each with distinct material properties. This systematic review and meta-analysis aims to compare the clinical and radiological outcomes associated with Ti and PEEK cages in lumbar interbody fusion procedures.

Methodology: A systematic review and meta-analysis comparing clinical and radiological outcomes between Ti and PEEK interbody cages in patients undergoing spinal fusion was performed on multiple databases. PubMed, Scopus, Web of Science, Embase, and Cochrane Central Register of Controlled Trials databases were searched and analysed. All studies that compared the clinical and radiological outcomes of patients who underwent Ti and PEEK cages were included. Subgroup analyses was performed to differentiate between patients who had cervical and lumbar interbody fusion.

Results: A total of 11 articles were identified, encompassing a total of 743 patients. Spinal fusion rates at final follow-up did not differ between Ti and PEEK cages (OR 1.50, 95% CI 0.57-3.94, P = 0.41), however, in patients undergoing lumbar fusion for non-infective conditions, Ti cages demonstrated a higher fusion rate (OR 2.12, 95% CI 1.05-4.28, P = 0.04). In patients with non-infective etiologies, Ti cages were associated with a higher incidence of subsidence compared to PEEK cages (RR 2.17, 95% CI 1.13-4.16, P = 0.02). No significant differences were observed between the two cage types in terms of operating time, postoperative hematoma formation, neuropathic pain, segmental angle correction, or postoperative clinical outcome improvement.

Conclusion: Ti cages may provide superior fusion rates in patients with non-infective lumbar spine conditions compared to PEEK cages. However, the increased risk of cage subsidence associated with Ti cages should be considered in clinical decision-making. Further high-quality randomized controlled trials are warranted to validate these findings and optimize interbody cage selection in lumbar fusion procedures.

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90 Days Post-operative Outcomes in Patients Undergoing Novel C3 Dome C7 Reverse Dome Open-door Laminoplasty - A Retrospective Study of Clinical Outcome Data

Choo J.S.H.1, Tan J.H.2 3 ,Sim S.I.2, Singh A.S.1, Ng K.X.C.1, Gnanam A2, Liu G.2 3
1Yong Loo Lin School of Medicine, National University of Singapore, Singapore
2National National University Hospital, Singapore, Singapore
3National University Spine Institute, Singapore, Singapore

Background: A novel C3 dome C7 reverse dome open-door laminoplasty technique was described in our feasibility and safety pilot study. This technique was designed to reduce post-operative complications due to preservation of semispinalis muscles insertion at C2/3 and trapezius muscle insertion at C7. Despite its promising initial results and the adoption of this technique by others, little has been published to describe the surgical complication rates and outcomes, especially with regards to the prevalence of post-operative neck pain, range of motion and post-operative C5 palsy.
Objective: The aim of this study is to report the 90 days post-operative outcomes in patients who underwent C3 dome C7 reverse dome open-door laminoplasty.
Methodology: A retrospective, single centre study was performed. A total of 70 patients who underwent C3 dome C7 reverse dome hybrid open-door laminoplasty were included in the study. Demographic data, radiographic parameters, and C5 palsy rates were collected at pre-operative, immediate post-operative, and 3-month post-operative intervals.
Results: Mean age of patients was 63.8 ± 8.5 years. 61.4% (n=43) of patients were male. Mean C7 SVA was 20.6 ± 30.3mm. K-line was positive in 93.9% (n = 62) of patients pre-operatively. 61.4% (n = 43) had cervical spondylo-myelopathy, 31.4% (n = 22) had ossification of posterior longitudinal ligament, and 7.1% (n = 5) had central cord syndrome. The average intra-operative blood loss was 222.50ml ± 124.2ml. None of the patients required blood transfusion post-operatively. No wound infection was noted amongst all patients. 10.4% (n = 7) reported post-operative pain requiring World Health Organisation (WHO) level 3 opioid analgesia and above. Only 1.5% (n = 1) had post-operative C5 palsy. Radiologically, C2 to C7 lordosis was preserved (pre-operative: 9.9º ± 10.7º, immediate post-operative 10.3º ± 11.0º, p-value < 0.001). Range of motion was reduced (pre-operative: 37.9º ± 12.2º, immediate post-operative 28.2º ± 12.5º). The severity of cervical spondylo-myelopathy was graded using the modified Japanese Orthopaedic Association (mJOA) score. The average pre-operative score is 12.7 (n=67), average at 1 year post score was 14.5 (n=37), average at 2 year mark 15.3,(n=29). The average improvement from pre-operative to immediate post-operative is 1.6 (n=37).
Conclusion: The novel C3 dome C7 reverse dome open-door laminoplasty technique is safe and is associated with a low complication rate. Patients experienced a significant improvement in the mJOA score. This technique may reduce the post-operative C5 palsy which can occur with the traditional laminoplasty technique.

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Functional Independence Measure (FIM) on Admission is a Good Predictor of Medium-term Outcomes for Acute Traumatic Central Cord Syndrome

A Aravin Kumar1*; Linda Lim Huiling1; Zhiquan Damian Lee1,2; Dinesh Shree Kumar4; Lester Lee1-3; Robin Pillay1; Ling Ji Min2,
1Department of Neurosurgery, National Neuroscience Institute, Singapore
2Department of Neurosurgery, Changi General Hospital, Singapore
3Department of Neurosurgery, Singapore General Hospital SGH, Singapore

Introduction: Acute traumatic central cord syndrome (ATCCS) has been reported to be the most common form of acute, incomplete spinal cord injury. Much has been published about ATCCS but this data is predominantly from North America, and the generalizability of these recommendations to Asian populations are still under investigation. We aim to characterize the nature of the disease in our local population and ascertain predictors of outcomes, so as to optimize the management of these patients.
Material and Methods: We conducted a retrospective cohort study in three tertiary specialist centers in Singapore from 2010 to 2023. We included all adult patients above the age of 18, diagnosed with ATCCS. Exclusion criteria include the lack of outcome data on discharge or on follow-up, atraumatic causes of central cord syndrome, presence of concomitant neurological pathologies which may confound neurological findings and/or recovery, such as demyelinating polyneuropathies or cranial pathologies. Prognostic scoring systems, based on the literature were also for all included patients. The primary outcome was meaningful functional improvement at 1-year follow-up compared to admission, defined to be an improvement in ASIA Motor Score (AMS) by a percentage improvement of approximately 20%. Secondary outcome was improvement in modified Japanese orthopedic association score (mJOA) by 50% at 1 year follow-up.
Results: 103 patients were included in our study. The mean age was 65.4 (SD: 12.6) years, and 90 (87.4%) patients were male. The mean Body Mass Index (BMI) was 25.0 (SD: 23.2), 22 (21.6%) patients had ossification of posterior ligament (OPLL) and 92 (89.3%) patients had pre-existing cervical spondylosis with stenosis. The majority of patients had an Eastern Cooperative Oncology Group (ECOG) score of 0 (85, 82.5%), which corresponded with 95 (92.2%) patients being independent in their activities of daily living (ADLs). The median AMS on admission was 84.0 (IQR: 30.0) with the mean upper extremity motor score (UEMS) being 37.0 (IQR: 18.0) and mean lower extremity motor score (LEMS) being 50.0 (IQR: 10.0). Median FIM on admission was 70.0 (IQR 48.0) and median mJOA on admission was 9.0 (IQR: 8.0). 61 (59.2%) of patients underwent operative management, with the median time to operation being 4.0 (IQR: 10) days. Median AMS at 12-months was 98.0 (IQR: 11.5), with median improvement at 12-months being 90.0% (IQR: 53.7). Secondary outcomes of mJOA were a median of 17.0 (IQR 5.5) at 1 year follow-up and median mJOA recovery rate of 66.7% (IQR: 63.6). The median ATCCSS was 2 (IQR: 1) and the median CCScore was 8 (IQR: 4). 79 (76.7%) patients had treatment concordant with ATCCSS whilst 61 (59.2%) patients had treatment concordant with CCScore. Univariate and multivariate analysis revealed that FIM on admission (OR 1.1, 95% CI 1.0 – 1.1, p = 0.040) was significantly associated with the primary outcome of significant improvement in AMS at 12 months. No significant predictors were found for the secondary analysis.
Conclusion: In our local Asian population, FIM score at presentation is a good predictor of the patient having good outcomes after 1 year for ATCCS.

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Comparison of C1 Expansive Open-door Laminoplasty and C1 Laminectomy with Occipito-cervical Fusion in Cervical Myelopathy with Lordotic Alignment: Sagittal Balance and Clinical Outcomes

HOWARD CHEN1234, KT YEH1235, CM CHANG123, IH CHEN13, TC YU13, WT WU1234
1 ORTHOPEDIC DEPARTMENT OF HUALIEN TZU CHI HOSPITAL
2 TAIWAN SPINE SOCIETY
3 INSTITUTE OF MEDICAL SCIENCE, TZU CHI UNIVERSITY
4 TZU CHI MEDICAL RECONSTRUCTION CENTER OF SPINAL CORD INJURY
5 GRADUATE INSTITUTE OF PHARMACY

Introduction: For patients with cervical myelopathy and lordotic alignment, subaxial laminoplasty is a well-established decompression method. However, the optimal surgical approach at the craniocervical junction remains controversial. C1 expansive open-door laminoplasty (C1-LP) preserves mobility but may affect sagittal balance, whereas C1 laminectomy with concomitant occipito-cervical fusion (C1-LE OCF) provides stability at the cost of range of motion. This study compares cervical sagittal balance and clinical outcomes between these two surgical techniques.

Methods: This retrospective study included patients with cervical myelopathy and lordotic alignment who underwent either C1 laminoplasty (C1-LP) or C1 laminectomy with occipito-cervical fusion (C1-LE OCF) between January 2016 and December 2021. Patients with idiopathic or traumatic atlantoaxial subluxation were excluded. Radiographic parameters—including C0-2 Cobb angle (CA), C2-7 CA, C0-2 range of motion (ROM), C2-7 ROM, cervical sagittal vertical axis (CSVA), and chin-brow vertical angle (CBVA)—were measured preoperatively, postoperatively, and at 6 months, 1 year, and 3 years. Functional outcomes were assessed at the same time points using the Japanese Orthopaedic Association (JOA) score, Visual Analogue Scale (VAS), and Neck Disability Index (NDI).

Results: A total of 36 patients were included and divided into two groups: C1-LP (n=18) and C1-LE OCF (n=18). Preoperatively, no significant differences were observed between the groups in terms of age, gender, radiographic parameters (C0-2 CA, C2-7 CA, C0-2 ROM, C2-7 ROM, CSVA, and CBVA), and functional outcomes (JOA, VAS, and NDI). Postoperatively, the C1-LP group retained significantly greater C0-2 ROM ($p<0.001$), while C2-7 ROM remained similar between groups. Both groups demonstrated significant JOA and NDI improvements at 6 months, 1 year, and 3 years. However, the C1-LE OCF group had persistently higher VAS scores at each postoperative time point, indicating greater residual neck pain (6 months: 2.9±0.3 vs. 4.8±0.6, $p=0.029$; 1 year: 2.5±0.3 vs. 4.2±0.6, $p=0.036$; 3 years: 1.9±0.2 vs. 3.9±0.5, $p=0.036$). Additionally, the C1-LE OCF group exhibited higher NDI scores, suggesting worse long-term functional outcomes (6 months: 16.8±2.2 vs. 14.5±2.5, $p=0.152$; 1 year: 17.6±2.0 vs. 13.5±1.5, $p=0.027$; 3 years: 17.0±1.9 vs. 10.9±1.1, $p=0.009$).

Conclusion: Both C1 laminoplasty and C1 laminectomy with OC fusion effectively improve clinical outcomes for cervical myelopathy with lordotic alignment. However, C1 laminoplasty preserves C0-2 mobility and is associated with lower postoperative neck pain and better long-term functional outcomes, while C1 laminectomy with OC fusion results in greater postoperative pain and higher long-term disability, despite ensuring better craniocervical stability.

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Trends in Spinal Decompression Surgery in Sengkang General Hospital: A Descriptive Observational Study

Lee KL[1], Gengatharan D[2], Thng JWC[1], Chau D[2], Neo GH[2], Huang YL[2]
1Department of Orthopaedic Surgery, Yong Loo Lin School of Medicine, National University of Singapore, Singapore
2Division of Spine Surgery, Department of Orthopaedic Surgery, Sengkang General Hospital, Singhealth Health Services, Singapore

Introduction: Spinal stenosis and degenerative spinal conditions are increasingly prevalent, significantly impacting patients' quality of life. Spinal decompression surgery, including open and endoscopic techniques, is an essential treatment for this condition. This study aims to describe trends in spinal decompression surgery at a tertiary teaching hospital in Singapore, focusing on changes in surgical volume, operative time, patient demographics, pathology, surgical techniques, and follow-up outcomes.

Methods: A retrospective observational study was conducted on 588 patients who underwent spinal decompression surgery between 2021 and 2024. Data collected included patient demographics, level of pathology, anatomical distribution, surgical techniques, and postoperative outcomes. The number of cases per surgeon per year was evaluated to assess workload distribution and demand. Additionally, mean operative times for single-level decompression cases and frequency of different techniques were used to identify trends in surgical efficiency.

Results and Discussion: The number of spinal decompression surgeries increased from 56 in 2021 to 217 in 2024, with a shift towards endoscopic procedures, rising from 0 in 2021 to 202 in 2024. Correspondingly, the number of open procedures declined from 56 in 2021 to 15 in 2024. Despite the increase in surgical volume, the number of surgeons performing these procedures remained at 6, resulting in a higher caseload per surgeon. The mean operative time for single-level decompression cases exhibited variations across the years, from 152 to 159 minutes. Non-elective cases had a longer mean operative time of 189 minutes compared to elective cases. Most patients (538/588, 92%) had lumbosacral pathology, while cervical and thoracic pathology were less common. Most procedures were elective (539/588, 92%). Among the 556 patients with documented follow-up for symptom recurrence, 546 (98%) had mild symptoms to complete symptom resolution, 2 (0.4%) had moderate symptom recurrence tolerable requiring conservative treatment, 2 (0.4%) had severe intolerable symptom recurrence requiring a revision surgery, 6 (1%) developed new onset of symptoms discrete from previous pathology levels affected.

Conclusion: This study highlights the increasing adoption of endoscopic spinal decompression as a preferred surgical approach in spinal stenosis. The shift towards minimally invasive techniques appears to be associated with favourable patient outcomes, including high rates of symptom improvement and low complication rates. However, the presence of a subset of patients who do not achieve full symptom relief or require revision surgery suggests the need for further investigation into factors influencing surgical success. Future research with long-term follow-up is needed to further assess the durability and comparative efficacy of different surgical methods.

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Solid Rod Tether for Thoracic Scoliosis? An Analysis of Progressive Curve Straightening and Overcorrection Behaviour in Anterior Single Rod Fusion for Thoracic Scoliosis with Minimum 5-year Follow-up

Law GW1, Poon G1, Kim SS2, Ruiz JNM1, Lau LL1, Liu GKP1, Wong HK1
1National University Health System, Singapore
2Yong Loo Lin School of Medicine, National University of Singapore, Singapore

Introduction: Spinal fusion for deformity correction in adolescent idiopathic scoliosis (AIS) occurs at the expense of growth post instrumentation while vertebral body tethering (VBT) allows non-fusion deformity correction, with risks of revision for tether breakage, curve under- and overcorrection. We

hypothesize that progressive curve straightening can also occur in anterior single rod fusion surgeries in skeletally immature patients for thoracic scoliosis, similar to growth modulation.

Methods: We retrospectively reviewed AIS Lenke 1 thoracoscopic assisted single rod anterior fusions from 2000-2013 in females aged 11-20 years with minimum 5-year follow-up. Patients with screw pullouts were excluded. Patients with Risser scores 0-3 at time of surgery (Group 1) were compared to those with Risser scores 4-5 (Group 2) for Cobb angle changes over time, complications and re-operations.

Results: Group 1 (n=19) and Group 2 (n=20) patients had similar preoperative coronal and sagittal radiological parameters. Preoperative main thoracic curves were 48.6 ± 13.2° (Group 1), and 45.3 ± 7.9° (Group 2) (p=0.338). Mean Risser grade was 2.4 ± 1.0 in Group 1 and 4.0 ± 0.0 in Group 2 (p<0.001). Postoperative instrumented thoracic curves were 10.7 ± 4.5° (Group 1), and 10.2 ± 5.4° (Group 2) (p=0.745). 15 patients (79%) in Group 1 and 4 patients (20%) in Group 2 had further curve straightening of more than 5° compared to their first postoperative erect radiograph (OR 3.9; 95% CI 1.6-9.8; p<0.001). Mean follow-up was 96 months (range 63-180 months). Curve straightening occurred progressively up to 5 years postoperatively in Group 1, and 1 year in Group 2. Mean overall curve straightening in these patients was 7.7 ± 2.4° in Group 1, and 6.8 ± 2.2° in Group 2. 7 patients (6 in Group 1, 1 in Group 2) had mild overcorrection (p=0.044). Only 1 patient required re-operation (from Group 2 for rod breakage). No other rod breakages occurred. Adding-on and correction loss (>5°) rates were similar.

Conclusion: Anterior single rod thoracic fusion behaves like a solid rod tether in skeletally immature patients, showing progressive curve straightening and mild overcorrection. This may be a useful alternative to VBT in growing patients with larger curves to avoid undercorrection and tether breakage.

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Surgical Corection of Post Tubercular Cervical Kyphotic Deformity: BSOH Experience

Shah Alam

Purpose: The outcomes of surgical treatment and related complications of post-tubercular kyphotic (PTK) deformity of the cervical spine or the cervico-thoracic spine were evaluated.

Methods: From January 2012 to Decembor 2025, 87 cases with PTK (49 males, 38 females) with an average age of 30 years (range 21–43 years) formed the study group. There were 82 patients with cervical deformities and 5 with cervico-thoracic kyphosis. Neurological function of all the patients was evaluated by the Japanese Orthopaedic Association (JOA) score and visual analogue scale (VAS) score. 75 patients underwent anterior debridement and reconstruction, using cages with bone grafts, while 12 patients with cervico-thoracic kyphosis received posterior instrumentation and fusion.

Results: The mean pre-operative focal kyphotic angle was 44.59° (range 30–69°), reducing to −9° (range −15–11°) postoperatively (at the last follow-up visit). The average operating time was 132.50 min (80–200 min) with an average blood loss of 115 ml (range 50–300 ml). Neurological assessment of all the patients, using the Japanese Orthopaedic Association (JOA) score and visual analogue scale (VAS) score, was improved significantly after surgery. All patients had solid fusion and no major complication was observed in the follow-up.

Conclusion: One-stage anterior debridement, instrumentation and fusion for cervical spinal TB and single posterior instrumentation for cervico-thoracic spinal TB followed by chemotherapy is practical to correct PTK. The procedure has the advantage of lower blood loss, effective kyphosis correction and minimal complications.

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Transformative Surgical Solutions for Adolescent Idiopathic Scoliosis: Achieving Optimal Outcomes with Minimal Instrumentation

[1]Prof. Dr. Md Shah Alam , [1]Dr Sarwar Jahan, [1]Dr Sharif Ahmed Jonayed, [3]Dr Abdullah Al Mamun, [4] Md. Ziaul Hasan

1 = Professor & Chief Consultant, Bangladesh Spine & Orthopedic Hospital (BSOH), Dhaka, Bangladesh

2 = Assistant Professor, National Institute of Traumatology & Orthopaedic Rehabilitation (NITOR), Bangladesh

3 = Senior Consultant, National Institute of Traumatology & Orthopaedic Rehabilitation (NITOR), Bangladesh

Background: Scoliosis surgery is a complex and highly specialized procedure aimed at correcting abnormal curvature of the spine. This condition, known as scoliosis, can range from mild to severe and can significantly impact a person's quality of life. The purpose of this abstract is to provide a concise overview of scoliosis surgery, including its indications, surgical techniques, potential risks and complications, and post-operative care.

Methods: From February 2009-Decembor 2024, 181 cases underwent surgery. 108 were female and 73 were male and age ranged 14-38 years. The pedicle is a power nucleus of the vertebra and offers a secure grip of all 3 columns. Pedicle screw instrumentation ensures rigid fixation with improved 3D correction. Accurate placement of screws is important to reduce possible irreversible complication. All cases were corrected by transpedicular screws and rods with minimum instrumentation addressing strategic vertebre. 172 cases were managed by only posterior approach and 9 cases required both anterior releases, costoplasty, posterior stabilization as well. Fusion was done in selected segments. Total follow up time was about 10 years (6 months-7 yrs). All patients were assessed by deformity correction, cosmesis, and functional outcome. Use of Neuromonitor is an excellent & effective method for prevention of post operative neuro deficit

Results: 40% patients had average coronal plane cobb's angle measuring about 70^0 pre-operatively and 17.12^0 immediate post-operative period. 2% patients developed neurodeficit. 3 regained completely but other regaining her neurological deficit very slowly. There were malposition of screws in 13%, painful prominence of screws in 10%, superficial infection in 4%. 80% patients improved cosmetically.

Conclusions: Scoliosis surgery is a valuable treatment option for individuals with significant spinal curvature. While it carries certain risks, advancements in surgical techniques and post-operative care have improved patient outcomes and overall success rates.

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Comparing Uniportal and Biportal Endoscopic Techniques in Lumbar Discectomy and Decompression: Which Approach Yields Superior Outcomes?

Ong SLS1, Mohamed H1, Teo HLT1, Yeo KSA1, Leong DL1, Dinseh SK1, Chew Z1

1Department of Orthopaedic Surgery, Changi General Hospital, Singapore

Introduction/Objectives: In today's ever-evolving landscape of spine surgery, endoscopic spine surgery has quickly gained traction amongst both surgeons as well as patients. Uniportal and biportal techniques have emerged as viable if not better alternatives than conventional or minimally invasive approaches for discectomy and decompression. However, the relative effectiveness of these two techniques remains debatable. This retrospective study aims to compare the outcomes of uniportal versus biportal endoscopic techniques in lumbar discectomy and decompression.

Materials and Method: Conducted in a tertiary integrated spine centre, a total of 31 patients who underwent endoscopic lumbar spine surgery were included across a 13-month period. 11 patients had uniportal surgery (4 discectomies and 7 decompressions) while 20 patients had biportal surgery (12 discectomies and 8 decompressions). Only one and two-level surgeries were included in this study. In total, 38 levels were performed. The main outcome measures

included were operative duration, length of hospital stay, and post operative complications. Statistical analysis was then performed to determine any significant differences between the two approaches.

Results/Discussion: Our findings suggest that the duration of surgery per level for biportal discectomy (101.54 ± 28.15 minutes) is significantly shorter compared to uniportal discectomy (123.75 ± 2.5 minutes) (p 0.05). There was also no significant difference in the length of hospital stay between the uniportal and biportal groups (p >0.05). All patients reported improvement in symptoms. However, 2 complications were recorded. 1 had a recurrence of back pain after 6 months post-biportal decompression while another had a dura tear during uniportal decompression which was sealed and the patient was discharged well.

Conclusion: Both endoscopic uniportal and biportal techniques can be effectively utilised for lumbar discectomy and decompression procedures with good outcomes.

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Efficacy of Schroth Exercises in Management of Adolescent Idiopathic Scoliosis within Asia

Chua H Z G1, Quek M T J1, Soh C C R1

Orthopaedic Surgery, Singapore General Hospital, Singapore

Introduction: The Schroth method in the management of Adolescent Idiopathic Scoliosis (AIS) consists of sensorimotor, postural and breathing exercises aimed at recalibration of normal postural alignment, stac/dynamic postural control, and spinal stability. This study was conducted to investigate the efficacy of Schroth exercises in management of AIS within a school screening programme.

Materials and Methods: A retrospective study was conducted on prospectively collected database of AIS patients seen at a single tertiary hospital in Singapore from 2022 to 2025. Inclusion criteria were patients diagnosed with AIS, aged between 10 to 18 years old, and participated in supervised Schroth exercises with the physiotherapists with no other ongoing or prior interventions such as bracing or surgery. Only patients that a ended a minimum of three sessions of Schroth exercises across at least three months were included in the study. Reasons for exclusion were most commonly not achieving the minimum frequency or dura on of Schroth exercises, with others being concurrent bracing or a lack of follow-up data. A control group involving AIS patients doing normal exercises, wearing a brace or having no intervention was also analysed for comparison. Cobb angle and Angle of Trunk Rota on (ATR) were measured in both groups, while SRS-22 (Scoliosis Research Society-22 patient questionnaire) scores were collected from the Schroth group.

Results: Out of 183 AIS patients seen for Schroth exercises during this period, 42 pa ents (23.0%) were included. A total of 42 were included as controls (Table 1). The Schroth group (71.4% females, mean age 13.72 ± 1.79 years, BMI 18.91 ± 3.71) attended 5.74 ± 2.75 sessions of Schroth exercises across 7.14 ± 4.29 months. Improvements in thoracic ATR (p=0.013, Cohen's d=0.40) and lumbar ATR (p=0.022, Cohen's d=0.37) were significant in the Schroth group (Table 2), but the change in Cobb angle was not significant (p=0.515, Cohen's d=-0.10). Improvement in quality of life was also represented by a significant improvement in SRS-22 scores (p=0.002, Cohen's d=-0.62). In the control group, changes in Cobb angle (p=0.053, Cohen's d=-0.31), thoracic ATR (p=0.409, Cohen's d=0.15) and lumbar ATR (p=0.808, Cohen's d=-0.04) were not statistically significant over the period of 7.57 ± 3.81 months. An analysis of patients who defaulted on physiotherapy showed that school and examinations played a major role in compliance to the sessions.

Conclusions: Schroth exercises are effective in improving ATR and SRS-22 scores, while effective in maintaining Cobb angle. Qualitative studies can also be carried out amongst those excluded from the study to investigate their reasons for not attending Schroth exercise sessions with the physiotherapists regularly.

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The Impact of Smoking Anterior Cervical Diskectomy and Fusion with Standalone Cages: Radiological and Functional Outcomes

Cassie Yang, Ngoh Xian Jun, Soh Chee Cheong Reuben, Chen Li Tat John, Ou Yang Youheng

Introduction: Standalone cages for anterior cervical discectomy and fusion (SA-ACDF) are simpler to implant but exhibit higher subsidence rates than traditional plate and screw constructs. Smoking is a recognized risk factor for subsidence, though several studies suggest functional outcomes remain unaffected. We hypothesized that smoking exacerbates subsidence after SA-ACDF, resulting in worse functional outcomes.

Methods: A retrospective review of patients who underwent primary single (SL) and double-level (DL) SA-ACDF from 2015–2022 was performed. Patients were categorized as Non-Smokers (NS) or Current/Ex-Smokers (CES). Patients with diagnosis of cervical myelopathy, radiculopathy, or myeloradiculopathy, age range 40–90 years were included. Patients with prior cervical spine surgery, tumor, or infection diagnosis were excluded. Data collected included patient biodata (age, gender, number of operated levels), radiological outcomes (1-year postoperative subsidence rates, 1-year Δtotal intervertebral height (TIH), 1-year Δlordotic angle), and functional outcomes (Japanese Orthopedic Association Score (JOAS), Neck Disability Index (NDI), Visual Analogue Scores for Neck Pain (VASNP) and Upper Limb Pain (VASLP) preoperatively, at 6 months, and at 2 years).

Results: 23 CES and 48 NS were identified. Between the groups, there were no significant differences in age or levels operated (p>0.05). A higher proportion of the CES group were males (p=0.001). Radiological Outcomes of CES vs NS: Subsidence rate at 1 year was 60.9% (n=14) vs 35.4% (n=17) (p=0.043). The ΔTIH was 2.4mm vs -1.7mm (p=0.038), ΔLordotic Angle was -4.1° vs -3.8° (p=0.78) and fusion rate was 91.3% (n=21) Vs 89.5% (n=43) (p=0.82). Functional Outcomes of CES vs NS: Preoperative JOAS was 11.4 vs 11.8, NDI 45.9 vs 35.4, VASNP 6.1 vs 4.1, and VASLP: 4.3 vs 2.3. At two years postoperatively, JOAS was 15.0 vs 14.8, NDI 19.8 vs 9.6, VASNP 2.4 vs 1.0 and VASLP was 2.1 vs 0.5. Improvement in all functional scores were found after surgery (p<0.05). The rate of functional improvements were similar (p>0.05). CES demonstrated persistently worse NDI, VASNP and VASLP scores (p<0.05) at all time periods. Smoking did not affect JOA scores.

Conclusion: In SA-ACDF, smoking is linked to significantly worse radiological and functional outcomes. Subsidence rates are almost twice as high in smokers. NDI, VASNP, and VASLP scores improve post-surgery but remain about twice as elevated in smokers at 2 years postoperatively.

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Effect of Sarcopenia on Post-operative Outcomes in Patients with Spine Metastases

Tan W. P. J.1, Heng W. T.2, Hallinan J.3, Shen L.4, Kumar N.5, 6, Tan J.H.J.5

1 Department of Orthopaedic and Spine Surgery, Alexandra Hospital, Singapore

2 Department of Orthopaedic and Spine Surgery, National University Hospital, Singapore

3 Department of Diagnostic Imaging, National University Hospital, Singapore

4 Medicine Biostatistics Unit, National University of Singapore, Singapore

5 National University Spine Institute, National University Health System, Singapore

6 University Spine Centre, Department of Orthopaedic Surgery, National University Hospital, Singapore

Introduction/ Objectives: Sarcopenia, characterized by the loss of muscle quantity and quality, has been associated with poor outcomes in various surgical settings. This study aims to evaluate the influence of sarcopenia on postoperative outcomes including delay in oncological treatment, prognosis vs survival, infection, and post-operative ambulatory status in patients surgically treated for MST.
Materials and Methods: A total of 264 patients who underwent surgery for MST in a single tertiary center between December 2005 and December 2021 were retrospectively analyzed. Sarcopenia was defined using the psoas muscle index (PMI) for quantity and psoas muscle density (PMD) for quality using preoperative imaging. Logistic regression models were used to evaluate the association of PMI and PMD with delay in oncological treatment, adjusting for age, preoperative Eastern Cooperative Oncology Group (ECOG) performance status, Charlson Comorbidity Index (CCI), and Oswestry spinal risk index, stratified by gender. T-test and one-way ANOVA were performed to evaluate the relationship between these parameters and prognosis vs survival, postoperative infection and postoperative ambulatory status.
Results/ Discussion: The mean age of patients was 61.5 years. Males had higher mean values for both PMI and PMD compared to females (PMI 1.150 ± 0.318 vs 0.905 ± 0.313; PMD 46.50 ± 8.16 vs 44.69 ± 10.34). In a multivariate analysis stratified by gender, both PMI and PMD were significantly associated with delay in oncological treatment in females (PMI p = 0.01, odds ratio 0.160, 95% CI 0.040-0.639; PMD p=0.04, odds ratio 0.955, 95% CI 0.914-0.997). In contrast, in males, only PMD was significantly associated with oncological treatment delay (p=0.007, odds ratio 0.957, 95% CI 0.927–0.988). Moreover, in males, higher PMD was significantly associated with longer survival than prognosticated (p<0.001, odds ratio 1.143, 95% CI 1.071-1.219). No significant trends were observed for PMI/ PMD with surgical infection or post-operative ambulatory status.
Conclusion: This study highlights the differential impact of sarcopenia, particularly psoas muscle density, on oncological treatment delays and survival outcomes in spine metastasis surgery. PMD appears to be a stronger predictor of survival in males and treatment delays in both genders, suggesting that muscle density may serve as an important prognostic factor in spinal metastases patients.

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Clinical Outcomes and Factors Influencing Success in Endoscopic Spine Surgery: A Retrospective Single-center Study in Singapore

Thng JTW, Wong NHP, Lee KL, Toh WJ, Neo GH, Huang YL

Introduction: Endoscopic spine surgery has gained traction as a minimally invasive approach for managing degenerative spinal conditions, offering advantages such as reduced tissue disruption, lower intraoperative blood loss, and faster recovery while maintaining favorable clinical outcomes. Despite its increasing adoption, there remains a need to evaluate surgical effectiveness, patient recovery patterns, and factors influencing outcomes in real-world clinical practice.
Methods: This retrospective study examines endoscopic spine surgeries performed at a single center by four lead surgeons. A comprehensive review of preoperative patient data, including demographic characteristics, pre-existing comorbidities, and symptom duration and presentation, was conducted. Surgical details, including operative duration and intraoperative complications, were analyzed. Postoperative hospital stay and long-term follow-up at regular intervals were assessed using patient-reported outcome measures, including the 36-item Short Form Survey (SF-36) and Visual Analogue Scale for Pain (VAS).
Results: Findings provide insights into postoperative recovery, symptom resolution, and functional improvements. Trends in operative time and potential factors influencing patient outcomes, such as baseline health status and surgical complexity, were examined. Additionally, intraoperative events and postoperative recovery trajectories were evaluated to assess the safety and efficacy of this technique.
Conclusion: Endoscopic spine surgery continues to demonstrate clinical effectiveness, with favorable patient-reported outcomes and a strong safety profile. Trends in operative efficiency and factors influencing surgical success highlight opportunities for optimization in patient selection and perioperative management strategies.

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Sacral Tarlov Cyst -A Rare Cause of Lower Limb Radiculopathy in a Child

Venkata Srujana Vedicherla1, David SK Mak1,2, Jonis ML Esguerra2, Lee Ping Ng2, Sharon YY Low1,2
1Department of Neurosurgery, National Neuroscience Institute, Singapore
2Neurosurgical Service, KK Women's and Children's Hospital, Singapore

Introduction: Tarlov Cysts (TC) are uncommon perineural cysts that may arise anywhere along the spine, especially in the sacral region. Studies have established that TCs are significantly more prevalent in adult females and those with collagen disorders. To date, symptomatic TCs in children are very rare. Most of these benign lesions tend to be incidental discoveries during neuroimaging for other reasons. Nonetheless, they have been occasionally reported to cause unsettling symptoms due to direct compression of the adjacent nerve roots. Examples include sensorimotor-related neuropathy in the lower back, pelvis, legs and urogenital system. We report an unusual case of a paediatric patient who presented with lower limb radiculopathy secondary to large sacral TCs and discuss the management.
Materials and Methods: A previously well 9-year-old female was referred for persistent lower back pain and left leg pain over a period of 2 months. There was no associated bladder or bowel symptoms. Clinical examination demonstrated a positive straight leg raise on the left, and reduced sensation along posterior left thigh, calf, foot dorsum and toes. Magnetic resonance imaging (MRI) of her spine showed prominent, large perineural cysts surrounding bilateral S1 and the right S2 cauda equina nerve roots. Of note, there was associated bony expansion and scalloping of the sacral canal and corresponding sacral foramina. After a trial of failed conservative treatment, she underwent a laminotomy, wide fenestration and partial excision of TCs. Of interest, it was noted that the baseline motor evoked potentials (MEPs) in her left S2 to S4 were lower than her right side at the start of the surgery. Postoperatively, her symptoms improved significantly, and she was discharged. At 6 months' follow-up, the there was no recurrence of the patient's lower back and leg symptoms.
Discussion: To date, causative factors underlying TCs remain unelucidated. One popular theory is that localised trauma and subsequent haemorrhage cause the blockage of venous drainage in the nerve perineurium and epineurium, leading to cystic degeneration and development of TCs. Following that, these TCs are connected to the subarachnoid space and the pulsatile CSF flow allows the cyst to expand due to a one-way valve mechanism. Management of adult TCs is well-described. In contrast, there is a paucity of contemporary literature on symptomatic TCs that are surgically treated in children. In our review, we highlight 9 such case reports whereby firstly, urinary incontinence is demonstrated to be the most common presenting symptom; and next, all cases of symptomatic TCs were treated successfully with microsurgical excision.
Conclusion: We therein describe a rare case of symptomatic sacral TC in a child whereby surgical treatment is a feasible treatment option in this age group.

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A Risk Quantification Reference Table for Progressed Adolescent Idiopathic Scoliosis Surgery: An Exact Case Matched Outcomes Analysis

Neo BXB[1], Leyu C[1], Tan JH[2], Sim S[2], Liu G[2]

[1]National University of Singapore, Yong Loo Lin School of Medicine

[2]National University Hospital, Department of Orthopaedic Surgery

Introduction: Adolescent Idiopathic Scoliosis (AIS) patients and their families often delay surgery despite recommendations, believing their condition is stable. However, delaying surgery can lead to curve progression, increasing surgical complexity and risks. This study aims to quantify the increased surgical burden and complications in AIS patients who defer surgery and develop severe curves (≥80°).

Methodology: A retrospective Exact Matched case-control study was conducted on AIS patients who underwent spinal fusion surgery at a single institution. Patients were grouped based on their Cobb angle at surgery: Group A (50–60°) and Group B (61–70°) had surgery as initially recommended. Group CFinal (≥80°) initially refused surgery but later underwent it due to curve progression. Each patient in Group CFinal was traced-back-in-time (TBIT) to compare their earlier clinical status at 50–60° (C1) and 61–70° (C2) with matched patients from Groups A and B. Exact Matching (EM) was used to match patients based on age, gender, BMI, Risser grade, Cobb angle, and Lenke curve type. Surgical parameters, complications, and outcomes were analyzed.

Results: A total of 614 AIS surgeries were reviewed. Utilizing the EM technique, a total of 302 AIS patients were recruited. There were 147, 111, 31, and 32 patients matched in Groups A, B, C_1, and C_2, respectively. As compared to group B patients, $C_{2\ Final}$ patients had 34% who experienced curve pattern change, 23.2% higher incidence of requiring two surgeries, and 17.3% increase in complications. There was a statistically significant increase of 2.4 spinal levels fused, 12% increase in implant density, 35% increase in operative time, 97% increase in intra-operative blood loss, 10% loss of scoliosis correction, 40% longer hospitalization stay, and 36% increase in costs for patients who had curve progression.

Conclusion: AIS patients who delay surgery beyond 50–60° Cobb angle face significantly greater surgical burden, higher complication rates, and increased costs. This study underscores the importance of early surgical intervention and provides a valuable risk reference for clinical decision-making and patient counselling.

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Does Adult Lumbar Scoliosis Affect the Lumbar Spine T-score Accuracy in the Diagnosis of Osteoporosis – A Review of over 6900 Asian Patients

Neo BXB[1], Leyu C[1], Tan JH[2], Sim S[2], Liu G[2]

[1]National University of Singapore, Yong Loo Lin School of Medicine

[2]National University Hospital, Department of Orthopaedic Surgery

Introduction: Osteoporosis, affecting over 200 million women globally, significantly impacts quality of life and healthcare systems. Dual-energy X-ray absorptiometry (DEXA) is the gold standard for diagnosing osteoporosis, with T-scores at the hip and spine being key metrics. However, degenerative spinal conditions, including scoliosis, can falsely elevate spine T-scores, leading to discordance with hip T-scores. This study investigates whether scoliosis exacerbates this discordance, impacting osteoporosis diagnosis and management in aging populations.

Methodology: A retrospective cross-sectional study analyzed 6,969 patients aged ≥40 who underwent DEXA scans over four years at a university hospital. Patients were categorized into scoliosis (Cobb angle ≥10°) and non-scoliosis groups. Spine and hip T-scores were classified as normal, osteopenic, or osteoporotic, with discordance defined as minor (1-grade discrepancy) or major (2-grade discrepancy). Statistical analyses included chi-square tests, t-tests, and multinomial logistic regression.

Results: The prevalence of scoliosis was 9.1%. Scoliotic patients were older (67 vs. 60 years, $p<0.001$) and predominantly female (94% vs. 91%, $p<0.001$). Mean spine T-scores were less negative in scoliotic patients (-1.28 vs. -1.08, $p<0.001$), while hip T-scores were more negative (-1.93 vs. -1.42, $p=0.180$). Discordance rates were higher in scoliotic patients: 44.1% minor and 5.0% major discordance vs. 39.0% and 2.8% in non-scoliotic patients ($p<0.001$). Multivariate analysis identified age >65, male gender, and scoliosis as significant predictors of discordance. Increasing Cobb angle showed a trend toward greater discordance, though not statistically significant.

Conclusion: This study demonstrates that scoliosis exacerbates discordance between spine and hip T-scores, rendering spine T-scores less reliable for osteoporosis diagnosis in scoliotic patients. Age >65 and male gender further increase discordance. These findings highlight the need to reconsider the use of spine T-scores in scoliotic patients, potentially reducing healthcare costs and improving diagnostic accuracy in this growing population.