## XVI. International TURKISH SPINE CONGRESS

*"Updates and New Horizons in Spinal Surgery"* 

May 22-25 , 2025 La Blanche Island, Bodrum









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## Full Texts



# XVI. International<br/>TURKISH SPINE<br/>CONGRESS"Updates and New Horizons in<br/>Spinal Surgery"My 22-25, 2025 / La Blanche Island, Bodrum

### EXTRUDED LUMBAR DISC MIGRATION: REPORT OF MULTI-CENTER CASE SERIES AND LITERATURE REVIEW

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#### Abstract

**Background Data:** Lumbar disc herniation is one of the most frequently encountered conditions in neurosurgical practice. Disc herniations may remain contained within the annulus or, by completely rupturing the annulus, may extrude and exhibit migration.

**Purpose:** The aim of this study is to shed light on etiology by examining the factors that may lead to migration through a case series and a review of similar series in the literature.

**Materials and Methods**: Patient data for a total of 60 patients with "extruded lumbar disc migration" were retrospectively analyzed from three centers, with an equal number of male and female patients. The patients' ages and magnetic resonance (MR) images were evaluated to assess the lumbar disc level, degree and direction of migration, lumbar lordosis angle, side of the herniation, and axial location.

**Results:** The average patient age was 47.25 years with equal gender distribution. Most common disc levels were L4-5 (41.7%) and L5-S1 (36.7%). Migration grades were mostly Grade 2 (33.3%) and Grade 1 (30.0%). Caudal migration was more frequent (75%). Mean lumbar lordosis angle was 24.15°. Lesions appeared more on the left side (53.3%) and in the subarticular region (58.3%). No significant correlation was found between migration direction and other parameters (p > 0.05).

**Conclusion:** Migrated lumbar discs are more common in the lower lumbar region, with caudal migration being more likely than cranial. Literature shows that patients with extruded migrating discs often have reduced lumbar lordosis. Migration was consistently craniolateral or caudolateral, likely due to the posterior longitudinal ligament acting as a midline barrier.

Keywords: disc herniation, extruded disc, cranial migration, caudal migration



#### Introduction

The intervertebral disc plays a key role in accommodating axial, rotational, and torsional loads—as well as asymmetric loads from flexion-extension and lateral bending movements—in the middle and anterior columns of the spine (1,2). Although the lifetime risk of symptomatic disc herniation is 1-3%, 60-90% of these cases resolve spontaneously. The risk factors include genetic and environmental influences, heavy activities, male gender, and smoking (1,3).

In addition, endplate degeneration, which disrupts the diffusion of disc metabolites, decreased proteoglycan content, and reduced nucleus hydrostatic pressure, all contribute over time to the loss of the disc's load-bearing properties (1). Three types of annular tears have been described: circumferential tears caused by shear stress, peripheral tears—most commonly occurring anteriorly— and radial tears that result from cyclic compression with bending (1). When the disc's load-bearing capacity is compromised and the annular layers are damaged, the nucleus pulposus may extrude, resulting in an "extruded disc herniation." This extrusion presents an additional surgical challenge, as it requires supplementary surgical maneuvers beyond the standard microdiscectomy technique. (2).

Although extruded discs have been shown in the literature to exhibit either cranial or caudal migration—with some series reporting dominantly cranial migration (4), and others caudal migration (2,5,6) — this study aims to elucidate the underlying mechanisms of migration by analyzing a case series alongside existing literature.

#### **Materials and Methods**

A retrospective analysis was conducted on extruded lumbar disc herniation cases exhibiting cranial and caudal migration at three centers between 2022 and 2025. In these cases, demographic data, disc levels, lumbar lordosis angle, and the axial location of the herniated nucleus were recorded. The lumbar lordosis angle was measured between the upper endplate of L1 and the lower endplate of L5. For the measurement of migration grade, the grading system based on sagittal magnetic resonance imaging (MRI) used by Ozturk et al. (2) was applied for its practicality. The length of the tip of the extruded fragment was measured as a percentage of the height of the adjacent vertebral body, and four grading intervals of 25% were defined (Grade 1: 0-25% up to Grade 4: 75-100%) for classification. Cases with spondylolisthesis, sequestration, and those without migration were excluded. Additionally, one foraminal and one central extruded disc were excluded from our series due to their lack of statistical significance. Statistical analyses were performed using SPSS, Version 26.0 (SPSS Inc., Chicago, IL, USA). The normal distribution of quantitative variables was evaluated using the Kolmogorov-Smirnov test. For normally distributed quantitative variables, descriptive statistics were expressed as mean  $\pm$  standard deviation; for non-normally distributed variables, the median (25th–75th percentile) was used; and categorical variables were expressed as frequency (%). For independent group comparisons, the independent samples t-test was used for normally distributed variables and the Mann-Whitney U test for non-normally distributed variables. The relationship between groups and categorical variables was examined using the chi-square test. A p-value of <0.05 was considered statistically significant.

#### Results

The mean age of the patients was  $47.25 \pm 12.67$  years (range: 15-76 years), with an equal gender distribution in this series. When examining the disc levels, the most common involvement was observed at L4–5 in 25 patients (41.7%) and at L5–S1 in 22 patients (36.7%), while L3–4 and L2–3 were detected in 11 patients (18.3%) and 2 patients (3.3%), respectively. Regarding the migration grades, 18 patients (30.0%) had Grade 1, 20 patients (33.3%) had Grade 2, 15 patients (25.0%) had Grade 3, and 7 patients (11.7%) had Grade 4 migration. With respect to migration direction, 45 cases (75%) exhibited caudal migration and 15 cases (25%) exhibited cranial migration. The mean lumbar lordosis angle was measured as 24.15 ± 4.79 (13–37) degrees. In terms of lesion side distribution, there was a slight predominance on the left side (53.3%). Although subarticular involvement (58.3%) was more common than paracentral involvement (41.7%) in terms of axial location, this difference was not statistically significant (p < 0.097). No significant relationship was found between the other evaluated parameters and the migration direction (p > 0.05). (Table 1 and Table 2)



#### Discussion

The risk of herniation in intervertebral discs, which degenerate over time from birth, peaks at around 41 years of age (3). In our study, the mean age of patients with extruded lumbar discs was 47 years, a finding similar to that reported in the literature. The most common levels for extruded disc herniation were the L4–5 and L5–S1 segments, in agreement with previous reports (5–9). (Fig. 1) This finding is considered to be an epidemiological result rather than directly related to disc extrusion, since more than 95% of all lumbar discs originate from the L4–5 and L5–S1 levels (3). The age and gender distribution of patients with extruded discs in our series was similar to those in the literature (5,8). (Fig. 2)

When comparing migration direction, current literature shows that caudal migration is more common than cranial migration (2,5,6,8). Although our case series did not reveal a statistically significant relationship, similar series have observed an increased rate of caudal migration with advancing age (5,6,8). This discrepancy may be due to the limited size of our case series. While Daghighi et al. (5) in a case series of 1020 patients, and Ahn et al. (8), in a series of 101 patients, found that cranial migration at lower lumbar levels was significantly decreased, Son et al. (6) in a series of 164 patients did not establish this relationship. This discrepancy might reflect a broader etiological factor affecting extruded discs. In fact, when considering all disc herniations, the frequency of herniation at the upper lumbar levels increases with age (10).

The lumbar lordosis angle has not been evaluated in previous case series; to our knowledge, this is the first study to examine its relationship with disc migration. Although no relationship was established between the direction of disc migration and the lumbar lordosis angle, Vialle et al. (11) eported a mean lumbar lordosis angle of 43(13.6-69) degrees between L1 and L5 in an asymptomatic population, whereas our series demonstrated a value of  $24.15 \pm 4.79$  degrees (range: 13–37). This marked difference between populations may provide insight into the etiology of disc extrusion. Our limited number of cases may have caused this discrepancy.

In our study, the vast majority of cases exhibiting extrusion and migration originated from the paracentral or subarticular regions. It is believed that the integrity of the posterior longitudinal ligament (PLL) and the strong connections between the endplate and the annulus in the midline play an important role in maintaining disc containment (2,9). In our series, only one case of purecentral cranial migration was observed, and it was excluded from the analysis due to its lack of statistical significance. Although subarticular migration was the most common, even in the paracentral group—where central bulging was observed—the extruded and migrated annular fragments were always located laterally.

The PLL consists of two layers: the superficial layer, which has a width of approximately 10 mm in the midline and extends longitudinally, and the deep layer, which runs from the center to the lateral aspect along the annulus. Another structure in the anterior epidural space is the relatively weak lateral membrane that extends from the upper annulus of one disc to the lower annulus of the disc immediately above it (2,8,9). This strong ligamentous structure is thought to play an important role in preventing disc extrusion by supporting the annulus in the midline, and it is suggested that in patients with a reduced lumbar lordosis angle, tension in the PLL forces the nucleus to migrate laterally and subsequently in a cranial or caudal direction.

#### Conclution

Although the literature shows that age and disc levels are independently associated with disc migration, these variables are also related to the frequency of lumbar disc herniation independent of migration. In light of this, it is thought that there may be other factors contributing to disc migration. A reduced lumbar lordosis angle may be one of these factors. It is suggested that tension in a strong PLL due to a "flat back" may prevent midline annular extrusion by forcing the disc material into the relatively weak lateral canal, much like squeezing toothpaste. Although our current case series is insufficient to definitively prove these hypotheses, we emphasize that it provides a foundation for future research.



#### **Acknowledgments**

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards. For this type of study, formal consent is not required.

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#### Tables

**Table 1.** Distribution of demographic characteristics

Charasteristics	
Age (mean±sd)	47,25±12,67
Gender (n(%))	
Female	30 (50,0)
Male	30 (50,0)
Migration (n(%))	
Caudal	45 (75,0)
Cranial	15 (25,0)
Disc Level (n(%))	
L2-3	2 (3,3)
L3-4	11 (18,3)
L4-5	25 (41,7)
L5-S1	22 (36,7)
Lumbar Lordosis Angle (mean±sd)	24,15±4,79
Side (n(%))	
Right	28 (46,7)
Left	32 (53,3)
Axial Location (n(%))	
Paracentral	25 (41,7)
Subarticular	35 (58,3)
Migration Grade (n(%))	
1	18 (30,0)
2	20 (33,3)
3	15 (25,0)
4	7 (11,7)

Descriptive statistics are given as mean±standard deviation or frequency (%).



Table 2. Comparison results of migration groups in terms of features

	Caudal	Cranial	р
Age	47,24±12,80	47,27±12,73	0,995
Gender			
Female	25 (55,6)	5 (33,3)	0,233
Male	20 (44,4)	10 (66,7)	
Disc Level			
L2-3	1 (2,2)	1 (6,7)	
L3-4	8 (17,8)	3 (20,0)	0,863
L4-5	20 (44,4)	5 (33,3)	
L5-S1	16 (35,6)	6 (40,0)	
Lumbar Lordosis Angle	23,91±5,19	24,87±3,34	0,414
Taraf			
Sağ	20 (44,4)	8 (53,3)	0,765
Sol	25 (55,6)	7 (46,7)	
Axial Location			
Paracentral	22 (48,9)	3 (20,0)	0,096
Subarticular	23 (51,1)	12 (80,0)	
Migration Grade	2,0 (1,0 - 3,0)	3,0 (2,0 - 3,0)	0,254

Descriptive statistics are given as mean±standard deviation, median (25th-75th percentile) or frequency (%).

#### Figures

Fig 1. Number graph of migration directions per level





#### Fig 2. Number graph of migration directions per age group





#### CADAVER-BASED TRAINING AND EDUCATIONAL VIDEO FOR UNILATERAL BIPORTAL ENDOSCOPIC LUMBAR SURGERY

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#### Abstract

**AIM:** To evaluate the feasibility of using sheep cadavers for training in endoscopic interlaminar discectomy and to develop a video-based training model for surgical education.

**MATERIAL and METHODS:** Five sheep cadavers were utilized in this study to simulate surgical conditions. Standard surgical equipment performed unilateral biportal endoscopic approaches at the L4-L5 level. An experienced surgeon created a training video and supervised the dissections conducted by five junior surgeons. Key parameters were meticulously analyzed, including entry points, needle angulation, and subjective technical challenges reported during the procedures.

**RESULTS:** The UBE was successfully completed in all five cadavers without major technical complications. All components of the surgical protocol, including discography, ligamentum flavum resection, and discectomy, were executed effectively using the designated instruments. Interlaminar endoscopic visualization of anatomical structures, including the ligamentum flavum, dural sac, and nerve root, was clear in all models. Five surgeons with no prior experience in UBE performed procedures at the L2-3, L3-4, and L4-5 levels. The time for triangulation and hemilaminectomy, flavectomy, and discectomy were recorded for each surgeon. The overall average times for all surgeons combined were 13 minutes and 51 seconds for triangulation and hemilaminectomy, 7 minutes and 1 second for flavectomy, and 3 minutes and 53 seconds for discectomy. Procedure times demonstrated a significant reduction as surgeons gained experience with the model.

**CONCLUSION:** The increasing indications and established benefits of endoscopic lumbar surgery emphasize the need for effective and safe training methodologies. This study demonstrates the feasibility of using sheep cadavers as an experimental model for developing technical proficiency in the interlaminar approach to endoscopy. Animal cadavers represent a practical alternative to human cadavers, reducing reliance on patient-based learning. Incorporating such models into training curricula has the potential to enhance surgical confidence, skill acquisition, and procedural efficiency, ultimately contributing to improved patient outcomes.

**Keywords:** Unilateral biportal endoscopic surgery; UBE; Lumbar surgery; Education; Cadaver; Minimally invasive surgery; Discectomy

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#### INTRODUCTION

The technological advancements of recent years have significantly transformed not only medicine and surgery but also medical education, particularly in the acquisition of surgical skills (7-11). Recent studies have shown that surgical simulation can reduce the learning curve for certain endoscopic techniques (14,20). Surgical simulation relies on high-fidelity teaching tools, such as simulators that provide a high degree of realism for the intended training. While human cadavers remain the gold standard in surgical education, their use is associated with significant infrastructure and logistical challenges, making them costly and not always readily available. As a result, experimental model cadavers present an appealing alternative, provided they are used ethically and responsibly, with careful consideration of their comparative anatomy. These models can serve as valuable tools for enhancing the learning curve in endoscopic spine surgery and improving clinical outcomes when performing unilateral biportal endoscopy (UBE) in human patients.(14,15)

UBE has gained significant popularity in spinal surgery due to its minimally invasive nature, reduced postoperative pain, faster recovery times, and improved clinical outcomes.(3,4,13,15-18) This approach allows for excellent visualization of neural and bony structures, making it suitable for various lumbar pathologies, including disc herniations and spinal stenosis. Despite these advantages, UBE has a steep learning curve, particularly for surgeons transitioning from conventional or other minimally invasive techniques. Mastery of UBE requires proficiency in both endoscopic navigation and handling dual-portal systems, which demand precise coordination and spatial awareness.(19) Moreover, the lack of widespread training programs and standardized educational tools further complicates skill acquisition. Consequently, the initial phase of learning UBE can be challenging, emphasizing the need for structured training models, such as cadaver-based simulations, to build confidence and technical proficiency while minimizing risks to patients.

This study aims to share our experience with using experimental models in UBE training and outline the comparative anatomical parameters of the technique, utilizing sheep cadavers as a tool for teaching surgical skills. Additionally, five surgeons with no prior experience in UBE tested this model, and their experiences were evaluated through a survey.

#### **MATERIALS and METHODS**

Five lomber sheep cadavers, obtained commercially from a meat processing plant, were used in this study. The causes of death were unrelated to the study's objectives. The procedures were conducted at the laboratory, in facilities specifically designed for training. The equipment used was dedicated exclusively to training and research at the institution. Participants initially performed the surgery at the L2-3 level. Subsequently, the same procedure was performed by the participants at the L3-4 and L4-5 levels. The surgical duration for laminectomy, flavectomy, and discectomy performed at each level was recorded. Fluoroscopy doses required for triangulation were also documented. Anatomical references for disc entry, relevant to both discography and discectomy, were recorded.

Sincan City Hospital Ethics Committee permission was obtained.

#### Unilateral Biportal Endoscopic Discectomy

The procedures were conducted using a 30°, 4-mm rigid arthroscope, a 4-mm spherical burr, a 3.5-mm radiofrequency (RF) ablation probe, and standard laminectomy instruments such as hook dissectors, Kerrison punches, rotating Kerrison punches, and pituitary forceps.

Cadavers were placed in the prone position. Two transverse incisions were made: a 5-mm incision at the cranial pedicle (viewing portal) and a 9-mm incision at the caudal pedicle (working portal), targeting the lower endplate of the vertebra cranial to the disc



space. Both incisions were positioned approximately 1–1.5 cm lateral to the midline and aligned with the midline or the inner edge of the pedicle. To facilitate water drainage during the procedure, the scalpel was tilted slightly toward the target lamina while making the incisions.

Bilateral channels were sequentially dilated using stepwise dilators until the inferior border of the superior lamina and the interlaminar space were accessible (Fig. 1A–C). The surgeon held the arthroscope in their left hand and operated instruments with their right hand. For right-sided disc herniations, the surgeon was positioned on the right side of the patient, with the viewing portal caudal and the working portal cranial, to optimize the use of their dominant hand (Fig. 1D–E). Through these two portals, the arthroscope and surgical instruments converged around the interlaminar window within a continuous perfusion water environment.

Key anatomical landmarks—including the inferior border of the superior lamina, the root of the spinous process, the superior border of the inferior lamina, the inner border of the facet joint, and the interlaminar ligamentum flavum—were identified and exposed (Fig. 2A).

Hemilaminectomy was performed with Kerrison Rounger (Fig. 2B–C). After that, the ligamentum flavum was excised (Fig. 2D), and neural structures were gently retracted with blunt instruments (Fig. 2E) to access and remove the intervertebral disc fragment (Fig. 2F). Adequate decompression was confirmed using a blunt probe. A representative case is provided in Video 1.

#### RESULTS

The UBE was successfully performed in all five cadavers without major technical complications. All steps of the surgical protocol discography, ligamentum flavum resection, and discectomy—were successfully executed with the instruments used. Furthermore, all interlaminar endoscopic anatomical structures, including the ligamentum flavum, dural sac, and nerve root, were clearly visualized in all models.

Five surgeons with no prior experience in UBE sequentially performed procedures at the L2-3, L3-4, and L4-5 levels. The time from incision to completion of triangulation and hemilaminectomy, the duration of flavectomy, and the discectomy time were recorded for each procedure.

#### Surgeon A

L2-3 level: Time to complete triangulation and hemilaminectomy: 16 minutes 28 seconds; flavectomy: 8 minutes 48 seconds; discectomy: 4 minutes 28 seconds.

L3-4 level: Time to complete triangulation and hemilaminectomy: 15 minutes 01 second; flavectomy: 7 minutes 55 seconds; discectomy: 4 minutes 01 second.

L4-5 level: Time to complete triangulation and hemilaminectomy: 14 minutes 12 seconds; flavectomy: 6 minutes 47 seconds; discectomy: 3 minutes 55 seconds.

#### Surgeon B

L2-3 level: Time to complete triangulation and hemilaminectomy: 15 minutes 21 seconds; flavectomy: 9 minutes 02 seconds; discectomy: 4 minutes 59 seconds.

L3-4 level: Time to complete triangulation and hemilaminectomy: 15 minutes 48 seconds; flavectomy: 8 minutes 55 seconds; discectomy: 3 minutes 34 seconds.

L4-5 level: Time to complete triangulation and hemilaminectomy: 13 minutes 23 seconds; flavectomy: 6 minutes 34 seconds;



discectomy: 3 minutes 18 seconds.

#### Surgeon C

L2-3 level: Time to complete triangulation and hemilaminectomy: 17 minutes 02 seconds; flavectomy: 10 minutes 47 seconds; discectomy: 5 minutes 48 seconds.

L3-4 level: Time to complete triangulation and hemilaminectomy: 14 minutes 09 seconds; flavectomy: 8 minutes 37 seconds; discectomy: 4 minutes 03 seconds.

L4-5 level: Time to complete triangulation and hemilaminectomy: 12 minutes 37 seconds; flavectomy: 7 minutes 03 seconds; discectomy: 3 minutes 23 seconds.

#### Surgeon D

L2-3 level: Time to complete triangulation and hemilaminectomy: 13 minutes 35 seconds; flavectomy: 6 minutes 32 seconds; discectomy: 3 minutes 21 seconds.

L3-4 level: Time to complete triangulation and hemilaminectomy: 12 minutes 15 seconds; flavectomy: 5 minutes 12 seconds; discectomy: 3 minutes 01 second.

L4-5 level: Time to complete triangulation and hemilaminectomy: 11 minutes 03 seconds; flavectomy: 4 minutes 02 seconds; discectomy: 2 minutes 58 seconds.

#### Surgeon E

L2-3 level: Time to complete triangulation and hemilaminectomy: 12 minutes 45 seconds; flavectomy: 5 minutes 05 seconds; discectomy: 4 minutes 46 seconds.

L3-4 level: Time to complete triangulation and hemilaminectomy: 11 minutes 13 seconds; flavectomy: 5 minutes 17 seconds; discectomy: 3 minutes 44 seconds.

L4-5 level: Time to complete triangulation and hemilaminectomy: 13 minutes 02 seconds; flavectomy: 4 minutes 46 seconds; discectomy: 3 minutes 03 seconds.

The average procedure times for each surgeon were calculated based on the L2-3, L3-4, and L4-5 levels. Surgeon A had an average triangulation and hemilaminectomy time of 15 minutes and 13 seconds, with flavectomy taking an average of 7 minutes and 50 seconds, and discectomy taking 4 minutes and 8 seconds. Surgeon B's average times were 14 minutes and 50 seconds for triangulation and hemilaminectomy, 8 minutes and 10 seconds for flavectomy, and 3 minutes and 57 seconds for discectomy. Surgeon C averaged 14 minutes and 36 seconds for triangulation and hemilaminectomy, 8 minutes and 26 seconds for flavectomy. Surgeon D performed triangulation and hemilaminectomy in an average of 12 minutes and 17 seconds, flavectomy in 5 minutes and 15 seconds, and discectomy in 3 minutes and 6 seconds. Surgeon E's average times were 12 minutes and 20 seconds for triangulation and hemilaminectomy, 5 minutes and 2 seconds for flavectomy, and 3 minutes and 51 seconds for discectomy. Overall, the average times for all surgeons combined were 13 minutes and 51 seconds for triangulation and hemilaminectomy, 7 minutes and 1 second for flavectomy, and 3 minutes and 53 seconds for discectomy.

The paired t-tests revealed statistically significant differences in the times required for triangulation and hemilaminectomy, flavectomy, and discectomy across the lumbar levels (L2-3, L3-4, and L4-5). For triangulation and hemilaminectomy, the time decreased significantly from L2-3 to L3-4 (p = 0.0156) and from L3-4 to L4-5 (p = 0.0271). Similarly, flavectomy times showed significant reductions between L2-3 and L3-4 (p = 0.0172) and L3-4 and L4-5 (p = 0.0085). For discectomy, significant improvements were observed from L2-3 to L3-4 (p = 0.0271) and from L3-4 to L4-5 (p = 0.0379). These findings indicate that experience gained at the L2-3 level contributes to statistically significant reductions in operative times at the subsequent L3-4 and L4-5 levels, highlighting



the importance of cumulative experience in improving surgical efficiency.

#### DISCUSSION

Disc fragmentectomy using a UBE is a minimally invasive procedure that yields results comparable to traditional techniques. However, it offers several advantages, including the preservation of adjacent anatomical structures, shorter hospital stays, and a reduced risk of complications. This safe, reproducible technique allows for effective decompression of both central and foraminal herniations (1,2,12,17). Despite these benefits, the procedure is technically demanding and has a steep learning curve.(15,17)

The results of this study confirm that the unilateral biportal endoscopic interlaminar technique is reproducible in sheep cadavers, making them a valuable training tool for developing technical skills during the early stages of procedural learning. Combined with findings from other studies showing improvements in endoscopic technique among surgeons trained with animal models, our results suggest that targeted training methods could expedite the learning process, reducing both the time and number of patients required to complete the learning curve (5,6).

Using sheep cadavers as a teaching tool offers several advantages. In addition to minimizing patient exposure during skill acquisition, it reduces reliance on human cadavers, which presents operational challenges. Sheep are readily available from certified meat processing plants, and their use for educational purposes does not require approval from animal ethics committees, as their death is unrelated to the study.

Regarding the technical challenges of the procedure, percutaneous entry was found to be demanding by the specialist surgeon. However, performing entry at this level in sheep cadavers could potentially facilitate easier entry in human patients. Therefore, since practicing on cadavers improves hand-eye coordination before performing the procedure on humans, it is recommended to practice on sheep before initiating this surgery.

Additionally, the absence of bleeding in the cadavers may make it more difficult to identify anatomical structures, which could pose a challenge for surgeons unfamiliar with endoscopic interlaminar anatomy. Statistical analysis of the data provides valuable insights for establishing a training protocol and developing early guidelines for inexperienced neurosurgeons. To our knowledge, this is the first study to report the use of sheep cadavers in an endoscopic interlaminar procedure.

In conclusion, further studies are needed to assess the effectiveness of simulation tools like sheep cadavers in developing specific technical skills. These studies could help demonstrate how such tools contribute to reducing the number of patients required to complete the learning curve while also minimizing associated complications.

#### Limitations

This study has several limitations that should be acknowledged. First, the anatomical differences between sheep and humans, particularly in terms of lumbar spine structure and size, may limit the direct applicability of the findings to human surgery. While sheep cadavers provide a cost-effective and accessible training model, they lack the physiological properties of live tissues, such as vascularity and tissue elasticity, which are critical during real surgical procedures. Additionally, the number of cadavers and junior surgeons involved in the study was relatively small, which may restrict the generalizability of the results. The subjective nature of the feedback collected through surveys also introduces potential bias in assessing the training model's effectiveness. Finally, while the study focused on technical skill acquisition, it did not evaluate long-term retention of the skills or their transferability to clinical settings. Future studies should address these limitations by incorporating larger sample sizes, comparative analyses with human cadaver models, and objective assessments of skill proficiency over time.



#### CONCLUSION

Surgical simulation has proven to be a valuable tool in training and the acquisition of manual skills by surgeons in training. The use of animal cadavers, particularly those obtained ethically, provides a highly realistic and effective tool for anatomical simulation. Sheep cadavers, in particular, offer a technically valid model for performing UBE. It is essential to continue developing simulation-based training models and to validate their impact on the learning curves of spine surgeons.

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#### **AUTHORSHIP CONTRIBUTION**

Study conception and design: MEG, EG, MIO, OKD Data collection: MEG, EG, MIO, OKD

Analysis and interpretation of results: MEG, EG, MIO, OKD

Draft manuscript preparation: MEG

Critical revision of the article: MEG, EG, MIO, OKD

All authors (MEG, EG, MIO, OKD) reviewed the results and approved the final version of the manuscript.

#### Figure

Figure 1. Position of the experimental model.

Figure 2. Interlaminar entry.

Figure 3. Placement of the cannula.

Figure 4. Endoscopic interlaminar discectomy.

Figure 5. Endoscopic view of the structures and endoscopic interlaminar procedures. Above left: resection of the ligamentum flavum; above right: ligamentum flavum, dural sac, and nerve root; below left: mechanical discectomy with forceps; below right: thermal discectomy with radiofrequency.

Figure 6. External and endoscopic views of the interlaminar endoscopy in cadavers.



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#### CONGENITAL MELANOCYTIC NEVUS AND HOLOCHORD PERIPHERAL NERVE SHEATH TUMOR: CASE REPORT

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#### ABSTRACT

**Background:** Congenital melanocytic nevus (CMN) is a benign pigment cell lesion present at birth, which rarely associates with spinal cord tumors. Holocord intradural peripheral nerve sheath tumors in pediatric patients with CMN have not been previously reported.

**Case Presentation:** We describe a unique case of a 2-year-old male with CMN presenting with respiratory distress and decreased lower extremity movement. Neurological examination showed intercostal muscle paralysis and abdominal breathing. Spinal MRI revealed a holocord intradural mass from C5 to L1 with heterogeneous contrast enhancement. Microsurgical tumor excision was performed from C5 to L1, achieving partial removal up to T3. Surgery was limited due to tumor adhesion and intraoperative cardiorespiratory depression.

**Outcome:** Two weeks postoperatively, the patient showed marked improvement in lower limb motor function and intercostal muscle involvement in respiration, resolving respiratory distress.

**Conclusion:** To our knowledge, this is the first reported case of a holocord intradural tumor associated with CMN in a pediatric patient. Partial resection can lead to significant neurological improvement while mitigating surgical risks. This case highlights the need for awareness and multidisciplinary management of such rare presentations.

Keywords: Congenital melanocytic nevi, Holochord, Paraparasia

#### INTRODUCTION

Congenital Melanocytic Nevus (CMN) is a benign skin lesion present at birth or appearing within the first weeks of life, caused by an abnormal accumulation of pigment cells called melanocytes. The color of CMN can range from light brown to black, and their size can vary from small to very large areas. Larger and giant nevi carry a higher risk of developing melanoma. Therefore, regular dermatological follow-up is recommended. The need for treatment depends on aesthetic, psychological reasons, or medical indications such as the risk of malignancy.

Holocord Peripheral Nerve Sheath Tumor is a rare tumor originating from the peripheral nerve sheath that involves the entire spinal cord. These tumors are usually benign, such as schwannomas or neurofibromas, but when they extend along the entire spinal cord, they can cause severe neurological symptoms. Clinical manifestations may include weakness, sensory loss, pain, and urinary control disorders, which are often progressive. Diagnosis is typically established by MRI. Treatment depends on the tumor type, extent, and the patient's clinical condition, with surgical resection and/or radiotherapy being considered.



#### **CASE REPORT**

A 2-year-old male patient, followed in the pediatric hematology and oncology department with a diagnosis of congenital melanocytic nevus [Figure 1], was referred to our clinic due to respiratory distress and decreased movement in the lower extremities. Neurological examination revealed paralysis of the intercostal muscles resulting in abdominal breathing, along with hypoactivity in the lower extremities. Laboratory findings were within normal limits, and there was no family history of CMN.

Spinal MRI demonstrated an intradural, heterogeneously contrast-enhancing mass extending from C5 to L1 along the spinal cord [Figure 1]. The patient was scheduled for intradural tumor excision, and the family was informed about the surgical procedure and provided written informed consent.

Using microsurgical techniques, the laminae between L1 and C5 were cut to allow re-suturing to intact bone [Figure 2]. Upon opening the dura, the tumor was found to be separable from the spinal cord [Figure 2]. Tumor tissue was excised up to the T3 level. Due to extensive adhesion of the tumor to surrounding tissue at this level and the development of respiratory and cardiac depression during maneuvers for further excision, the surgery was concluded with residual tumor left in situ.

During the two-week postoperative follow-up, the patient demonstrated increased movement in the lower extremities and recruitment of the intercostal muscles during respiration, leading to resolution of respiratory distress.



Figure 1. Sagittal MRI (Intadural lesion extending between C5-L1), Preop appearance of a patient with congenital melanocytic nevus

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Figure 2. Intraoperative observation

#### DISCUSSION

Congenital melanocytic nevi (CMN) are benign pigmented lesions that originate from melanocytes located in the dermis and are present at birth. They are typically identified in early childhood and can vary significantly in size. The incidence in congenital cases is approximately 1 in 20,000, and lesions larger than 20 cm are classified as giant CMN. Although they are mostly benign, CMN can undergo malignant transformation into melanoma in approximately 10% of cases and may lead to systemic complications<sup>1</sup>.

Mutations in the Ras gene have been associated with congenital melanocytic nevi and the development of neuroblastoma, a condition referred to as CMN syndrome. Given the wide spectrum of possible neurological abnormalities in CMN syndrome, prognosis can vary greatly. However, the development of primary melanoma in the skin or central nervous system is typically associated with a poor outcome<sup>2</sup>.

Peripheral nerve tumors fall under the broader category of soft tissue tumors and are therefore managed by various subspecialties, including plastic surgery, dermatology, orthopedics, and neurosurgery. However, as they originate from or are located in close proximity to neural structures, improper management may lead to significant neurological deficits extending well beyond the adjacent soft tissue structures<sup>3</sup>. Peripheral nerve sheath tumors are classified into schwannomas, neurofibromas, intraneural perineuriomas, malignant peripheral nerve sheath tumors, their variants, hybrid nerve sheath tumors, and malignant melanotic nerve sheath tumors<sup>4</sup>.

Holocord peripheral nerve sheath tumor, a rare tumor arising from nerve sheath cells, may be either benign or malignant. It typically



forms around the nerve roots and spinal cord, most commonly presenting with symptoms such as pain, neurological deficits, and functional impairment. Treatment options are determined based on the tumor's location, size, and the patient's clinical presentation.

#### CONCLUSION

To the best of our knowledge, the coexistence of congenital melanocytic nevus and a holocord peripheral nerve sheath tumor has not been previously documented in the literature. This rare combination, involving both melanocytic and peripheral nerve sheath origins, is thought to represent an ectodermal-derived anomaly. Given the potential for significant neurological compromise, early recognition and a multidisciplinary approach are essential for optimal management. This case highlights the importance of considering underlying neuroectodermal abnormalities in patients with extensive CMN and contributes valuable insight into the clinical spectrum of CMN-associated complications.

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#### **RELAPSE AFTER EGGSHELL HEMIVERTEBRECTOMY IN CONGENITAL SCOLIOSIS**

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#### INTRODUCTION

Congenital Scoliosis is a progressive three-dimensional deformity of the spine that occurs after a vertebral developmental defect at 4 to 6 weeks of gestation, resulting in an deterioration of longitudinal growth. The precise etiology of congenital scoliosis is unclear. Although most cases seem to be sporadic, the role of genetic and environmental factors is reported (1, 2).

Congenital scoliosis is uncommon in the general population. Its true incidence is unknown, but the familial incidence in the congenital scoliosis population is typically 1% to 5% (3, 4).

Congenital scoliosis is rarely amenable to bracing, unlike idiopathic scoliosis. (5). Treatment of congenital vertebral anomalies requires a focus on early diagnosis and appropriate surgical treatment before major curvatures develop (6, 7).

The main principle of operative treatment is support of growth while controlling the deformity. Five major operations have been described: posterior spine fusion, combined anterior and posterior spine fusion, convex hemiepiphysiodesis, hemivertebra excision, and guided growth by vertical expandable prosthetic titanium rib (VEPTR) or growing rods (8).

Hemivertebra is one of the most common causes of congenital scoliosis, a pathology that can lead to severe scoliotic deformity in adulthood (9).

Lee CS et al. reported that the hemivertebrectomy procedure is one of the commonly used acute correction techniques for congenital scoliosis, but it should be cautioned against significant complications such as increased blood loss, long operation time, technically challenging and potential neurologic deficit (10).

The hemivertebra may be segmented, hemisegmented or unsegmented. Semi-segmented and non-segmented hemivertebrae generally do not demand treatment, while fully segmented hemivertebrae may need prophylactic treatment to avoid severe deformity (11).

In this article, we would like to add to the literature the recurrence of scoliosis in a case of hemivertebrectomy and posterior fusion performed with egg shell procedure in a patient with congenital scoliosis.

#### CASE

Our patient, a 2-year-old girl, was admitted to us because of waist asymmetry in the lumbar region noticed by her family. Physical examination revealed no skin discoloration or hairy skin patch, abdominal examination, thoracic examination and neurological examination were normal. Firstly, a standing two-way orthorontgenogram was performed and evaluated (Figure 1).

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Figure 1: Pre-operative orthorontgenogram.

A full-segmented hemivertebra was found in the L5 vertebra causing decompensation throughout the body. Orthorontgenogram evaluation revealed truncal shifting and L5-S1 cobb angle was 38 degrees (Figure 2). Since the hemivertebra was a fusion defect and was known to be associated with other system anomalies (such as VACTERL), the examination was detailed and whole spine MRI and whole spine CT scans were ordered for surgical planning. Deformity analysis and additional intraspinal pathologies that may be associated were investigated. No other pathology other than a congenital hemivertebra was found in detailed examination and investigations. No consultation was required for other system valuations.



Figure-2: Trunkal Shift And L5-S1 Cobb Angel.



Our surgical procedure; after the patient was prepared in prone position and neuromonitoring, transpedicular polyaxial screws were inserted into the vertebrae at one upper and one lower level through the appropriate posterior incision, the posterior hemiarch of the hemivertebrae was removed, part of the pedicle was removed, and the spongy bone was removed with the help of a curette by entering the corpus from the projection of the pedicle, the removed spongiosseous bone was then used for fusion. Following vertebral decancellation, rods were placed between the pedicle screws, and the shell hemivertebra was compressed and crushed to achieve deformity correction.

Postoperative orthorontgenogram showed that correction was achieved (Figure 3). The patient was placed in a trunk cast postoperatively and mobilized on the first postoperative day. She was followed up with a cast for the first month and then with a Boston brace for 5 months. At 6-month intervals, the patient was called for follow-up and evaluated with an orthorontgenogram. At the last follow-up visit 24th month, it was found that Trunk shift developed, spine balance was disrupted, and scoliosis recurred (Figure 4 a-b). It was found that the old pedicle screws remained short due to the growth of the spine and the screws in the sacrum loosened (Figure 5). Revision surgery was planned.



Figure 3: After Surgery First Orthorontgenogram (With The Brace).



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Figure 4: Clinical photographs obtained at the 6th-month (a) and 24th-month (b) follow-up visits demonstrating the postoperative trunk alignment and overall clinical appearance.





Second surgical procedure; the patient was prepared in supine position with the same surgical preparation and neuromonitoring. Anterior retroperitoneal approach was performed in coordination with pediatric surgeon. Remnant hemivertebrae excised. The patient was then placed in the prone position. The lumbar pedicle screws were extended through the old incision and the loosened screws in the sacrum were revised and additional screws and additional rods were placed one proximal and one distal to the convex side of the extension. The additional rods and screws placed in the second operation were placed to move the body to the midline with support from the iliac wing. The operation was terminated after the correction was achieved (Figure 6). No intraoperative or postoperative complications were encountered. The patient was mobilized on the 1st day after the operation without any brace.

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Figure 6: Second post-operation

#### DISCUSSION

Congenital scoliosis is an embryologic developmental defect. These developmental defects of vertebrae can be formation defects, segmentation defects, or mixed types(6).

The major complications of total hemivertebrectomy prompted the search for other techniques. Gonzalo Arriagada et al. concluded that patients who underwent hemivertebrectomy with the eggshell technique had a shorter hospital stay, faster fusion, less bleeding, no neurologic complications, and no reoperation was planned in any of the patients. As a disadvantage of the method, they concluded that the amount of correction in the coronal and sagittal planes was angularly less than direct hemivertebrectomy (12).

Hemivertebra is the most commonly seen formation defect. Our patient had congenital scoliosis due to hemivertebra. Heart, kidney, and spinal cord malformations may accompany congenital scoliosis (13). However, in our patient, no malformation accompanying congenital scoliosis was found in the examination and tests performed.

Treatment of congenital scoliosis aims to prevent the progression of the deformity to a level that disrupts body balance. The place of conservative treatment methods is very limited. As a result of studies, surgical treatment has become the main treatment method for congenital spinal curvatures (14).

The degree of scoliosis: the variety of hemivertebras, their location, the number of hemivertebrae and their relations, and the patient's age (15). Semi-segmented and non-segmented hemivertebrae generally do not demand treatment, while fully segmented hemivertebrae may need prophylactic treatment to avoid severe deformity (11). Five main surgical procedures have been described: posterior spine fusion, combined anterior and posterior spine fusion, convex hemiepiphysiodesis, hemivertebra excision, and directed growth with vertical expandable prosthetic titanium ribs (VEPTR) or growing rods (8). We performed posterior hemivertebrectomy and short level fusion surgery in our patient. However, we performed hemivertebrectomy with an eggshell procedure.

Total excision of the hemivertebra has important advantages such as good recovery and the use of the excised hemivertebra as graft material. However, hemivertebra excision has significant disadvantages such as a high neurologic deficit rate, high amount of blood loss, prolonged surgical time, as well as technical difficulty (10).

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The most important reason for choosing posterior hemivertebrectomy and single level fusion as the surgical procedure in our patient was to eliminate the pathology causing scoliosis and to correct the coronal deformity at the same time. Ruf M et al. also emphasized that hemivertebrectomy is an intervention that allows simultaneous correction of the deformity as well as elimination of the pathology causing scoliosis. Hemivertebrectomy can be performed with only posterior intervention to evacuate the hemivertebra (egg-shell), anterior-posterior combined interventions or total removal of the hemivertebra with only posterior interventions.

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Fusion of the hemivertebra excision area is necessary to prevent the development of instability. Since surgical intervention in congenital scoliosis is performed while the spine is still developing and growing, fusion should be performed at the least possible number of levels. We performed a single-level (L5-S1) fusion in our patient. Ruf M et al. concluded that in the treatment of congenital scoliosis, it is appropriate to obtain a spine with an appropriate physiological profile in the coronal and sagittal planes and to perform fusion at the least possible level while achieving this (16).

Gonzalo Arriagada Ocampo et al. compared posterior hemivertebra excision with eggshell procedure and total hemivertebrectomy with direct posterior approach and found that the mean curvature correction percentages were lower in cases with eggshell procedure; they stated this as a negative aspect of eggshell procedure. In our case, the correction was complete, but the recurrence of scoliosis after 2 years led us to conclude that it would be useful to re-study the eggshell procedure with larger patient groups. In addition, in the same study, it was emphasized that the eggshell technique caused less blood loss compared to other hemivertebrectomy options, the hospital stay was shorter, the healing process was faster, it caused less blood loss, and the surgical technique was more reliable (12).

#### CONCLUSION

In this case report, we concluded that the eggshell procedure may be preferred for hemivertebrectomy in congenital scoliosis cases because it is safer and causes less morbidity, but as a complication of this procedure, if the vertebral corpus is not adequately decanalized, (decancell) the vertebral body may continue to grow and the deformity may recur. We anticipate that excision of the hemivertebra safely with anterior surgery and subsequent addition of nonfusion fixation to the iliac wing with the upper vertebra from the fusion level contributes to the improvement of the trunk shift since it increases stability and this operation may decrease the possibility of recurrence compared to single level fusion.

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#### DOES PEDICLE SCREW LENGTH AT FRACTURE LEVEL AFFECT MECHANICAL STABILITY IN SHORT SEGMENT POSTERIOR FIXATION OF THORACOLUMBAR FRACTURES? A BIOMECHANICAL STUDY

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#### Abstract

**Purpose:** While pedicle screw placement at the fracture level improves stability in short-segment posterior instrumentation for thoracolumbar fractures, the optimal screw length remains controversial. This study biomechanically compared short ( $\leq$ 50% vertebral body length) and long ( $\geq$ 70%) screws in a sheep burst fracture model.

**Methods:** Twenty-one fresh sheep thoracolumbar spines with simulated (a falling weight model) L1 burst fractures (AO Type A4) were randomly divided into three groups: Group 1 (no fracture-level screw), Group 2 (short screws:  $\leq$  50% of the vertebral body length /20 mm), and Group 3 (long screws:  $\geq$  70% of the body length/35 mm). Mechanical stability was assessed under axial loading, flexion/extension, lateral bending, and axial rotation using a Shimadzu AG-X universal testing machine. Statistical analyses were conducted with the Shapiro-Wilk, Kruskal-Wallis, Mann-Whitney U, and Wilcoxon Signed Rank tests.

**Results:** Incorporating a fracture-level screw significantly improved stability versus Group 1 (p < 0.01). However, no differences existed between short and long screws in axial loading ( $0.91 \pm 0.19$  mm vs.  $0.89 \pm 0.26$  mm, p = 0.87), flexion/extension ( $1.41 \pm 0.20$  mm vs.  $1.17 \pm 0.24$  mm, p = 0.12), lateral bending ( $1.27 \pm 0.31$  mm vs.  $0.88 \pm 0.11$  mm, p = 0.09), or axial rotation ( $80.44 \pm 41.31$  mm vs.  $71.44 \pm 29.51$  mm, p = 0.23).

**Conclusion:** Short screws ( $\leq$ 50% vertebral body length) provide biomechanical stability equivalent to long screws ( $\geq$ 70%) in short-segment posterior fixation. While clinical concerns about anterior structure compromise with long screws persist, our data suggest surgeons may prioritize shorter screws to mitigate risks without sacrificing stability. These findings should be validated in long-term clinical studies.

Keywords: Thoracolumbar fractures; Short-segment instrumentation; Pedicle screw length; Biomechanics

Competing interests: The authors declare that they have no competing interests.

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#### INTRODUCTION

Spinal fractures are among the most prevalent and serious injuries, often leading to substantial morbidity and mortality. The thoracolumbar region, spanning from T10 to L2, is especially susceptible to injury due to its unique anatomical position. This area serves as a critical junction where the rigid thoracic spine transitions into the more flexible lumbar spine, creating a biomechanical weak point that is prone to fractures under stress or trauma [1-2].

The AO Spine thoracolumbar injury classification system serve as the basic framework for systematically categorising vertebral fractures, describing injury morphology and mechanical instability through a hierarchical grading scheme [3,4]. Surgical intervention is unequivocally indicated for injuries scoring >4 on this ordinal scale and is consistent with evidence-based thresholds for instability. Notably, even borderline scores at the threshold of 4 often warrant operative management, as the clinical balance in this range is often such that many surgeons prefer stabilisation to optimise biomechanical stability and neurological preservation [5]. Surgical management of thoracolumbar fractures involves anterior, posterior, or combined approaches. The posterior approach is preferred for its lower morbidity, reduced operative duration, and blood loss compared to anterior techniques, offering clinical advantages [6–8]. Although combined approaches demonstrate superior radiological outcomes, evidence suggests equivalent long-term functional recovery across methods [9]. Selection should prioritize patient-specific factors and surgical proficiency.

Posterior fixation selection—short- versus long-segment—is guided by surgeon expertise and injury factors. Long-segment instrumentation offers the advantage of enhanced stability, which is particularly beneficial in preventing post-surgical correction loss. However, this approach comes with trade-offs, including reduced spinal mobility, longer operative times, and increased blood loss. On the other hand, short-segment instrumentation mitigates these drawbacks by preserving mobility and reducing surgical complexity, but it carries its own risks, such as potential correction loss and inadequate healing of the spinal canal. Current evidence recommends long-segment fixation for thoracic fractures to enhance stability and mitigate correction loss, while short-segment approaches are favored in the lumbar spine due to biomechanical compatibility with its inherent mobility [10–12].

Biomechanical [13–17] and clinical studies [18–21] demonstrate that integrating the fractured vertebra into short-segment pedicle screw constructs enhances spinal stability, reduces mechanical stress on implants, and improves load distribution. This technique lowers hardware failure risk and supports optimal healing outcomes. Evidence indicates that short-segment fixation incorporating the fractured vertebra achieves kyphosis correction and sagittal alignment comparable to long-segment techniques [22], challenging historical preferences for more extensive constructs. Strategically applied short-segment approaches offer similar corrective efficacy while reducing invasiveness and preserving motion, underscoring the value of individualized strategies based on biomechanical suitability and clinical objectives.

Screw placement strategies for fractured vertebrae remain debated, with variations in technique reflecting injury complexity. Some protocols recommend shorter screws at the fractured level to minimize iatrogenic compromise while maintaining stabilization [23]. Conversely, other studies propose equivalent screw lengths across fractured and intact vertebrae to optimize load-sharing and construct uniformity [24]. These diverging methods underscore the absence of standardized guidelines, necessitating case-specific adaptation based on fracture morphology and biomechanical objectives. The choice between polyaxial and monoaxial screws in thoracolumbar fracture fixation involves distinct biomechanical trade-offs. Polyaxial screws enable intraoperative versatility in trajectory adjustment, advantageous for navigating disrupted anatomical structures, while monoaxial screws enhance construct rigidity, improving deformity correction and mitigating implant failure risks [19,25]. These considerations highlight the need for patient-specific evaluation, balancing anatomical feasibility and fracture stability requirements.

Although one clinical trial investigated the medium-term results of the relationship between screw length and fracture level screw placement in short segment posterior instrumentation [18], biomechanical comparisons of this technique are not available in the literature. No study has systematically analyzed the effect of screw length on spinal stability, load-sharing dynamics, or long-term structural integrity within this technique. This gap necessitates an investigation into the mechanistic understanding of the



observed clinical benefits and requires empirical validation to align surgical practice with biomechanical principles. In this study, a sheep vertebral fracture model was used to perform a biomechanical analysis of the effects of screw length inserted into the fractured vertebra on the stability of short segment posterior fixation of thoracolumbar fractures. The effects of short or long screw lengths at the fracture level on structural stiffness, load distribution and mechanical behaviour were compared. By evaluating these parameters, the study aims to address the lack of empirical data on screw length biomechanics in the fractured vertebra, provide evidence to improve clinical screw selection and optimise instrumentation strategies for improved postoperative stability and fracture management.

#### Methods

The present animal cadaver study was conducted under approval from the Institutional Ethics Committee of Dokuz Eylül University (approval number: 2023/27-14).

#### Sample Preparation

While human cadavers remain ideal for clinical relevance, logistical constraints—including scarcity, ethical protocols, and biosafety risks—often limit their use, necessitating validated surrogates such as sheep models [26]. Sheep spines are frequently utilized in thoracolumbar biomechanical research due to their anatomical and mechanical resemblance to human spines, particularly in load-bearing patterns and segmental kinematics [27].

This study utilized 21 fresh sheep cadavers (approximately 12 months old) with T10–L5 spinal segments. Soft tissues were surgically dissected with preservation of interspinous ligaments, facet capsules, and intervertebral discs to retain biomechanical fidelity (Figure 1). Specimens were cryopreserved at -40°C post-dissection to inhibit tissue deterioration during pre-experimental phases. Structural integrity was prioritized to replicate physiological loading conditions in subsequent biomechanical analyses.



Figure 1 The spinal segment spanning T12 to L2 was stabilized using an experimental construct incorporating PVC fixtures to simulate fixation



Frozen specimens underwent gradual thawing: 12 hours at 4°C followed by 12 hours at ambient temperature to preserve tissue homogeneity. For mechanical testing, T11 and L3 vertebrae were embedded in PVC fixtures using polymer resin, maintaining T12–L2 exposure for fracture induction and biomechanical assessment (Figure 1). This controlled preparation methodology standardizes specimen geometry and boundary conditions, ensuring experimental reproducibility across all trials while maintaining physiological load-transfer characteristics during mechanical testing.

#### **Creation of the Burst Fracture Model**

The L1 vertebra—the most common thoracolumbar fracture site [28,29]—was selected as the target level. Standardized fractures were generated using a patient-specific PLA jig (fabricated via additive manufacturing) based on an established osteotomy protocol [30]. This device facilitated three controlled osteotomies: two sagittal (anteroposterior) and one coronal (mediolateral), preserving posterior vertebral elements (pedicles, laminae) to replicate clinically relevant instability patterns while ensuring procedural consistency across specimens (Figure 2).



Figure 2 A standardized L1 burst fracture was surgically replicated using 3D-guided osteotomy, achieving precise anatomical control over fracture geometry and injury mechanics.

This study employed a modified falling-weight technique—previously validated in human, porcine, and bovine models [30-35] to induce AO Type A4 burst fractures in sheep spines. A custom apparatus was constructed, comprising a steel platform (0.61 × 0.61 m) with parallel cylindrical rails (3.8 cm diameter) and a central impactor featuring a hemispherical head. A 5 kg mass, constrained by vertical rails, was suspended at 1.2 m height and released to generate controlled axial loading on the L1 vertebra following baseline flexibility testing (Figuge 3). Post-impact, fractures were radiologically confirmed via CT to ensure standardized injury severity and anatomical reproducibility (Figure 4). This methodology replicates traumatic burst fracture mechanisms while addressing interspecies anatomical variability through device calibration.

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Figure 3 The experimental fracture mechanism orchestrated under

Figure 4 Axial CT imaging reveals the anatomical detail of an L1 burst fracture generated experimentally via a gravity-driven falling mass apparatus, demonstrating controlled replication of fracture morphology at the targeted vertebral level.

was replicated using a gravity-driven falling mass apparatus, methodically precisely controlled laboratory conditions to emulate the dynamic progression of fracture development.



#### Surgical Technique

After creating the fractures, the specimens were randomly assigned to one of three groups. The ideal dimensions for the pedicle screws were determined by examining a healthy L1 vertebra, which revealed a pedicle width of 5 mm and a pedicle-to-anterior cortex length of 35 mm (Figure 5 a-b). Based on these measurements, two screw lengths were selected for intermediate screw fixation: 20 mm (representing  $\leq$  50% of the vertebral corpus length) and 35 mm (representing  $\geq$  70% of the vertebral corpus length) (Figure 5 c-d).



**Figure 5 a-** Morphometric analysis of the sheep L1 vertebra revealed an anterior cortical length (including the A-facet joint) of 35 mm. Pedicle screws designed to traverse the pedicle and occupy <50% of the vertebral body depth were measured at 20 mm in length. **b-** The pedicle width was quantified at 5 mm, establishing anatomical constraints for screw placement. **c-** In Group 2 (short-segment posterior instrumentation), a 20 mm short pedicle screw was anchored at the fracture level, ensuring minimal penetration into the vertebral corpus. **d-** Group 3 (short-segment posterior instrumentation) utilized a 35 mm pedicle screw at the fracture level, corresponding to 70% of the anterior cortex length, to evaluate the biomechanical impact of extended screw engagement.

Posterior short-segment instrumentation was then applied using the Roy-Camille technique [36-37]. To maintain consistency, pedicle screws with a diameter of 5 mm and rods with a diameter of 6 mm were utilized (Medtronic CD Horizon<sup>™</sup> Legacy<sup>™</sup>) (5 mm diameter) and titanium rods (6 mm diameter) were used [38]. The groups (n=7 each) were defined as follows:

- 1. Group 1: Short-segment fixation (T12-L2) without fracture-level screws.
- 2. Group 2: T12–L2 fixation with 20 mm screws (<50% vertebral body length) at L1.
- 3. Group 3: T12–L2 fixation with 35 mm screws (≥70% vertebral body length) at L1.



The key difference between Groups 2 and 3 lay in the length of the fracture-level screws relative to the vertebral body, while all other hardware components remained standardized. To ensure anatomical compatibility, the rods were carefully contoured to align with the natural curvature of the sheep's spine.

All surgical procedures were carried out by a skilled spine surgeon (A.M.O.), ensuring precision and expertise throughout the process.

#### Biomechanical Testing

Biomechanical testing was conducted in the state-of-the-art Biomechanics Laboratory at Dokuz Eylul University. Each specimen was subjected to a series of rigorous tests—axial loading, flexion/extension, lateral bending, and axial torsion—using a Shimadzu AG-X universal testing machine (10 kN capacity). A consistent axial load of 400 N was applied at a rate of 60 mm/min, adhering to parameters established in prior studies [39-40].

- 1. Axial Loading: The specimens were axially compressed to evaluate their maximum displacement under a 400 N load. This test provided critical insights into the spine's ability to withstand compressive forces.
- Flexion/Extension and Lateral Bending: The range of motion (ROM) [41-43] was assessed at the T12-L2 segment. For flexion/extension, the spine was tested at 25°, while lateral bending was evaluated at 10° (Figure 6 a-b). A force of 400 N was applied at a speed of 60 mm/min, and the resulting displacement values were meticulously recorded to quantify spinal flexibility and stability.
- 3. Axial Torsion: The specimens were securely fixed in a torsion device, and torque was applied at a rate of 0.2°/s until failure occurred (Figure 7). The maximum elongation at the point of failure was documented, providing valuable data on the spine's resistance to rotational forces.

These comprehensive tests allowed for a detailed analysis of the biomechanical properties of the specimens under various loading conditions, ensuring a thorough understanding of their structural behavior and failure mechanisms.



Figure 6 a- Flexion/Extension Test b- Lateral Bending Test
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Figure 7 Positioning of the fixed sheep vertebrae in the torsion device

### Statistical Analysis

The collected data were analyzed using SPSS 23.0 software. Descriptive statistics, including means, medians, interquartile ranges (IQR), and minimum/maximum values, were calculated to summarize the dataset. The Shapiro-Wilk test was employed to evaluate the distribution of the data, determining whether it followed a normal distribution.

For non-parametric comparisons across the groups, the Kruskal-Wallis test was utilized to identify significant differences. When pairwise comparisons were necessary, the Mann-Whitney U test was applied. Additionally, paired data were analyzed using the Wilcoxon Signed Rank test to assess differences within the same group under varying conditions.

A p-value of less than 0.05 was established as the threshold for statistical significance, ensuring robust and reliable conclusions from the analyses. This comprehensive statistical approach allowed for a thorough examination of the biomechanical data, providing meaningful insights into the performance of the different experimental groups.

### RESULTS

This study was conducted at the Biomechanics Laboratory at Dokuz Eylul University's Department of Orthopedics and Traumatology. Throughout the biomechanical testing process, the experimental setup and specimens proceeded smoothly without any unforeseen complications. Data for each specimen—such as maximum displacement, applied force, and deformation—were meticulously recorded using a Shimadzu AG-IS 10 kN Universal Testing Machine (Kyoto, Japan).



The biomechanical tests focused on measuring maximum displacements under 400 N loads across various conditions, including axial loading, flexion/extension, lateral bending (both left and right), and the failure point during axial rotation. Descriptive statistics, encompassing mean, standard deviation, minimum, maximum, and median values, were calculated and summarized for each group, as detailed in Table 1.

P	arameter	Axial (mm)*	Flexion/Extension (mm)*	Left Bending (mm)*	Right Bend- ing (mm)*	Axial Rotation (mm)**
G1 (n=7)	Mean ± SD	1.88 ± 0.33	4.70 ± 1.21	2.69 ± 0.65	2.44 ± 0.56	24.35± 6.39
G2 (n=7)	Mean ± SD	0.91 ± 0.19	1.41 ± 0.20	1.27 ± 0.31	1.32 ± 0.30	80.44± 41.31
G3 (n=7)	Mean ± SD	0.89 ± 0.26	1.17 ± 0.24	0.88 ± 0.11	0.91 ± 0.11	71.44 ± 29.51

#### Table 1 Descriptive Data for All Groups

G:Group, n:Number

\*Maximum displacement values under a 400 N/m load

\*\*Maximum displacement values at the point of system failure

The addition of a screw at the L1 level following burst fractures demonstrated a notable enhancement in the system's stability across all tested conditions—axial loading, flexion/extension, lateral bending, and axial rotation—when compared to the conventional short-segment posterior instrumentation technique. This improvement highlights the potential benefits of incorporating an additional screw in stabilizing such fractures. However, when comparing systems utilizing short screws versus long screws at the fracture level, no statistically significant differences were observed in terms of performance under axial loading, flexion/extension, lateral bending, or axial rotation (as illustrated in Figures 8-9). These findings suggest that while the inclusion of a screw at the L1 level is advantageous, the choice between short and long screws at the fracture site may not significantly influence the overall stability of the construct.



**Figure 8** The displacement values (in millimeters) under a 400 N/m load are presented for axial loading, flexion/extension, and right/left lateral bending movements. This figure provides a comparative analysis of biomechanical stability across the different groups under these loading conditions.





Figure 9 Displacement values (in millimeters) at the point of system failure during axial rotation illustrate the biomechanical stability of the instrumentation under rotational stress for each group.

#### **Axial Loading**

The incorporation of screws at the fracture site led to a significant improvement in stability under axial loading when compared to the traditional short-segment posterior instrumentation technique (p=0.002). Maximum displacement under 400 N loads decreased markedly from 1.88 ± 0.33 mm in Group 1 to 0.91 ± 0.19 mm in Group 2 and 0.89 ± 0.26 mm in Group 3, demonstrating the effectiveness of this modification. Interestingly, no statistically significant differences were observed between the use of short and long screws at the fracture level, indicating that both options provided comparable stability. This relationship can be summarized as G1 < G2 = G3, as detailed in Table 2. These findings underscore the value of adding screws at the fracture site for enhancing stability, while suggesting that the choice between short and long screws may not be a critical factor in achieving optimal results.

Parameter		Mean ± SD (mm)	p-value
	G1	1.88 ± 0.33	
Axial Displacement (mm)	G2	0.91 ± 0.19	0.002*
· · · · · · · · · · · · · · · · · · ·	G3	0.89 ± 0.26	G1 <g2=g3**< td=""></g2=g3**<>
Flexion Displacement (mm)	G1	4.70 ± 1.21	
	G2	1.41 ± 0.20	0.001*
	G3	1.17 ± 0.24	G1 <g2=g3**< th=""></g2=g3**<>
Left Bending Displacement (mm)	G1	2.69 ± 0.65	
	G2	1.27 ± 0.31	<0.01*
	G3	0.88 ± 0.11	G1 <g2=g3**< th=""></g2=g3**<>



Right Bending Displacement (mm)	G1	2.44 ± 0.56	
	G2	1.32 ± 0.30	<0.01*
	G3	0.91 ± 0.11	G1 <g2=g3**< th=""></g2=g3**<>
Axial Rotation Displacement (mm)	G1	24.35± 6.39	
	G2	80.44± 41.31	0.002*
	G3	71.44 ± 29.51	G1 <g2=g3**< th=""></g2=g3**<>

**Table 2** The relationship between the three groups subjected to short segment posterior segmental instrumentation. Comparisons between groups were performed using the Mann-Whitney U test, while the overall relationships among the three groups were assessed with the Kruskal-Wallis test.

Statistical tests used: Kruskal-Wallis test () and Mann-Whitney U test (\*\*).

#### Flexion/Extension

Under 400 N loads, the traditional short-segment posterior instrumentation technique exhibited a maximum displacement of  $4.70 \pm 1.21 \text{ mm}$ , which was significantly higher compared to the displacements observed in Groups 2 and 3. Specifically, Group 2, which utilized short screws, showed a maximum displacement of  $1.41 \pm 0.20 \text{ mm}$ , while Group 3, employing long screws, demonstrated a displacement of  $1.17 \pm 0.24 \text{ mm}$  (p=0.001). These results highlight the superior stability achieved by incorporating screws at the fracture site, regardless of their length. Importantly, the data revealed no significant difference in stability between short and long screws, reinforcing the conclusion that screw length does not play a critical role in enhancing stability. This relationship is succinctly represented as G1 < G2 = G3, as outlined in Table 2. These findings emphasize the effectiveness of adding screws at the fracture site while suggesting that the choice between short and long screws may be less consequential in achieving optimal stabilization.

#### Lateral Bending

For left and right lateral bending, the maximum displacements in Group 1 were measured at  $2.69 \pm 0.65$  mm and  $2.44 \pm 0.56$  mm, respectively. These values were significantly reduced in Groups 2 and 3, with Group 2 showing displacements of  $1.27 \pm 0.31$  mm (left bending) and  $1.32 \pm 0.30$  mm (right bending), and Group 3 demonstrating even greater stability with displacements of  $0.88 \pm 0.11$  mm (left bending) and  $0.91 \pm 0.11$  mm (right bending). These results underscore the enhanced stability achieved by incorporating screws at the fracture site compared to the traditional technique. Notably, no statistically significant differences were observed between left and right bending within each group, nor were there significant differences between the use of short and long screws (p>0.05), as detailed in Tables 2 and 3. This suggests that the addition of screws, regardless of their length, provides consistent and improved stability in lateral bending scenarios.

		p-value*
Group 1	Right- Lateral Bending	0.91
	Left Lateral Bending	
Group 2	Right Lateral Bending	0.345
	Left Lateral Bending	
Group 3	Right Lateral Bending	0.463
	Left Lateral Bending	



**Table 3** While subtle variations in right and left lateral bending displacements were noted within each group, statistical analysisconfirmed these differences lacked significance (p > 0.05). This finding underscores a consistent biomechanical symmetryduring lateral bending maneuvers across all experimental groups, suggesting uniform stability and load distribution regardless ofdirectional force application.

#### **Axial Rotation**

Failure displacement during axial rotation exhibited a pronounced disparity across groups, with Groups 2 and 3 demonstrating markedly reduced values ( $80.44 \pm 41.31$  mm and  $71.44 \pm 29.51$  mm, respectively) when compared to Group 1 ( $24.35 \pm 6.39$  mm) (p = 0.002). Notably, screw length at the fracture level showed no statistically significant influence on outcomes, as both short and long screws yielded comparable biomechanical performance (G1 < G2 = G3) (Table 2).

In conclusion, direct comparison of Groups 2 (short screws) and 3 (long screws) revealed no significant differences in stability across all loading conditions (p > 0.05, Mann-Whitney U test), confirming screw length had no biomechanical impact.

While this investigation primarily aimed to assess biomechanical variations between long and short pedicle screw constructs in fractured vertebrae during short-segment posterior spinal fixation, a notable secondary observation emerged from cadaveric analyses. We posit that quantitative assessment of such postoperative displacements by computed tomography (CT) may provide greater precision in clinical evaluations; however, in this study, fragment separation and anterior migration were detected during pre-experimental visual examinations and measured manually (in millimetres) before biomechanical testing. These displacements exceeding 2 mm (in two cases exceeding 5 mm) were recognised in all Group 3 specimens. Notably, the shorter screw cohort (Group 2) showed no detectable displacement under the same observation conditions. Despite the consistent use of screws exceeding 70% vertebral corpus dimensions in the long screw cohort, no instances of anterior encroachment into adjacent structures were observed in any specimen.

#### DISCUSSION

Key findings of this study are by compering Group 1 vs. Groups 2/3 fracture-level screws reduced displacement by 52–68% in axial loading (p = 0.002) and flexion/extension (p = 0.001). Also by comparing Group 2 vs. Group 3 no significant differences in stability across all loading conditions (p > 0.05) (Table 2).

The management of fractures in orthopedic and spinal surgery often involves divergent biomechanical principles, particularly regarding implant placement. In trauma surgery, inserting screws directly at the fracture line during plate osteosynthesis is discouraged due to heightened risks of stress concentration and subsequent implant failure [44]. However, spinal fixation surgery adopts a contrasting paradigm, where the application of pedicle screws at thoracolumbar fracture sites has become a cornerstone for enhancing segmental stability. This dichotomy underscores the nuanced interplay between anatomical site, load-bearing dynamics, and healing biology. Posterior short-segment instrumentation, which includes the fractured vertebra, has gained prominence for its capacity to restore sagittal alignment and correct kyphosis comparably to long-segment constructs while minimizing surgical morbidity [22, 45]. Despite these advances, debates persist regarding the optimal screw length at the fracture level, with conflicting evidence on whether short or long screws confer superior biomechanical or clinical outcomes. Our biomechanical study contributes to this discourse by demonstrating that screw length—short versus long—does not significantly influence stability in thoracolumbar fractures treated with short-segment posterior fixation.

Posterior pedicle screw fixation remains a gold standard for thoracolumbar fractures due to its proven efficacy in achieving rigid stability, reduced operative time, and lower complication rates compared to anterior or combined approaches [6–8, 45, 46]. However, traditional short-segment constructs (one level above and below the fracture) have been associated with high rates of

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correction loss and implant failure, attributed to excessive stress on the rostral and caudal screws. These challenges have driven the adoption of fracture-level screw augmentation as a critical modification. By integrating screws at the injury site, surgeons distribute mechanical loads more evenly across the construct, mitigating stress shielding and enhancing resistance to cyclic loading [17, 49–51]. Clinical studies corroborate these biomechanical advantages. Behairy et al. showed in a prospective study that short-segment pedicle screw fixation incorporating the fractured vertebra effectively reduced unstable thoracolumbar injuries and improved correction of segmental kyphosis, vertebral wedging, and vertebral height loss [47]. Dobran and Güven further reported that short-segment fixation with fracture-level screws achieved sagittal alignment outcomes equivalent to long-segment constructs, with the added benefit of preserving motion segments [18, 22]. Our findings align with these observations, affirming that fracturelevel screw placement enhances stability regardless of screw length.

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This study's primary focus was analyzing biomechanical differences between long and short screws in fractured vertebrae stabilized via short-segment posterior fixation. However, cadaver testing revealed a pivotal secondary result: screws larger than 70% of the vertebral body's diameter at fracture sites caused bone fragment separation and forward shifting in Group 3. Shorter screws exhibited no instability. Intriguingly, despite all long screws surpassing this size threshold, none led to anterior encroachment into adjacent tissues. These outcomes were observed in a sheep model under conditions of surgically induced peri-vertebral soft tissue excision. However, extrapolating these biomechanical results to human clinical contexts—where peri-fracture soft tissue integrity remains preserved—warrants caution. The observed mechanical disruption of fracture apposition in the experimental model raises concerns that analogous screw configurations in intact human tissues may impede osseous union by destabilizing fracture reduction. A critical gap persists in the current literature regarding the biomechanical consequences of transpedicular screw placement in comminuted vertebral body fractures. Specifically, systematic postoperative imaging analyses (e.g., CT or MRI) to evaluate introgenic fragment displacement or implant interposition remain absent. No prior studies have quantitatively assessed whether screw insertion into fractured vertebrae may inadvertently displace bony fragments, create interfragmentary gaps, or compromise osseous consolidation through mechanical interference. While posterior instrumentation procedures aim to stabilize spinal fractures, the potential for screws to act as levers-exacerbating fragment separation or impeding fracture healing via interposed positioning—has not been systematically investigated through advanced imaging modalities. This oversight leaves unresolved questions about the relationship between screw geometry, fragment dynamics, and delayed union in comminuted fractures. This underscores the need for further translational studies to reconcile experimental biomechanical data with clinical outcomes in fracture management protocols.

Kose et al. posited that long screws risk displacing anterior fragments and inadequately supporting the fractured vertebral body [48], a phenomenon observed in our study. In contrast, short screws may promote fragment reduction by harnessing tension across the anterior and posterior longitudinal ligaments [49]. Additionally, shorter implants could mitigate adverse effects on fracture healing caused by non-biological materials within the fracture zone, potentially reducing long-term kyphosis recurrence. Fracture-level screws may also diminish motion at the implant-bone interface, bolstering construct rigidity [17, 49–51]. However, excessive rigidity does not inherently guarantee clinical success, necessitating long-term clinical validation. Öztürk et al. observed comparable one-year outcomes in kyphosis correction and alignment between short and long screws [20], noting that long screws in comminuted fractures risked displacing fragments or interposing between fracture lines, potentially impeding union. These insights reinforce our recommendation for short screws at the fracture level.

The selection of screw length at the fracture level involves balancing mechanical stability against iatrogenic risks. Long screws, which traverse the entire vertebral body, theoretically maximize pullout strength by engaging denser anterior cortical bone. However, Kose et al. cautioned that overly long screws risk displacing anterior fracture fragments, potentially compromising the integrity of the fractured vertebral corpus [48]. In our experimental model, long screws indeed caused anterior fragment displacement >5mm in 2/7 of specimens, consistent with these concerns. Conversely, short screws—terminating within the posterior two-thirds of the vertebral body—appear to facilitate fragment reduction through tensioning of the anterior and posterior longitudinal ligaments, thereby promoting anatomical alignment [49].

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A critical consideration is the biological impact of implant placement. Long screws introduce non-biological material deep into the fractured corpus, which may impede vascularization and delay osseous union. This phenomenon, termed "stress shielding," can exacerbate kyphosis recurrence over time due to uneven load distribution. Short screws, by occupying less volume within the vertebral body, may mitigate these effects while still reducing micromotion at the metal-bone interface [49–51]. Nevertheless, excessive construct rigidity, whether from long or short screws, risks creating a non-physiological stress environment, underscoring the need for balanced mechanical and biological integration. While biomechanical studies provide foundational insights, clinical validation remains paramount. Öztürk et al. conducted a 12-month follow-up study comparing short and long screws in 45 patients with thoracolumbar fractures. They observed no significant differences in kyphosis correction or sagittal alignment between groups [20]. Notably, long screws were associated with fragment displacement in comminuted fractures, corroborating our experimental findings. These results challenge the assumption that longer screws inherently improve outcomes and highlight the context-dependent nature of screw selection—particularly in fractures with severe anterior column comminution.

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While this study focused on screw length, prior biomechanical work highlights the role of screw diameter in stability. Larger diameters (e.g., 6–7 mm) increase pullout strength but risk pedicle breach in narrow anatomies [15, 50]. Future studies should explore interactions between diameter and length.

Some studies in the literature advocate for deeper screw insertion into the fractured vertebra in posterior instrumentation, emphasizing the biomechanical advantages. Liu et al. [52] demonstrated through biomechanical analysis that screw placement at 60% of the vertebral body mitigated the loss of postoperative height correction, establishing this threshold as a critical benchmark. Further investigations corroborate that increasing screw depth from 50% to 80% enhances stability under bending and torsional loads by 30%, while Matsukawa et al. [53] reported an inverse correlation between screw depth and loosening probability, attributing this to improved load distribution at the bone-screw interface. Wang et al. [54] similarly concluded that longer screws enhance trabecular bone purchase and endplate support, recommending insertion depths exceeding 60% of the vertebral body length on lateral imaging for thoracolumbar fractures. Contrary to these findings, our biomechanical cadaveric study revealed no significant difference in efficacy between short and long pedicle screws within fractured vertebrae. While prior studies emphasize the superiority of extended screw placement for stability, our empirical data demonstrate equivalent performance in load-bearing capacity, resistance to displacement, and maintenance of anatomical alignment. These results challenge the universal recommendation for long screw placement and suggest that shorter screws may be sufficient in certain clinical contexts. Further research integrating patient-specific factors (e.g., bone density, fracture morphology) is warranted to refine surgical guidelines and optimize outcomes.

Our study has several limitations. While our fresh-frozen sheep spine model is a validated biomechanical surrogate, anatomical disparities with human spines warrant cautious extrapolation. Second, osteoporosis's biomechanical impact was not assessed via DEXA, though randomized specimen allocation minimized confounding variables. Third, reliance on a standardized fracture model limits generalizability to heterogeneous fracture patterns. Fourth, while our fresh-frozen sheep spine model provides a validated platform for controlled biomechanical testing, several inherent constraints must be acknowledged. First, as a cadaveric model, it inherently excludes biological processes such as fracture healing, osseointegration, and soft-tissue remodeling, all of which critically influence long-term implant performance in vivo. The absence of dynamic loading—simulating physiological forces from daily activities like walking or bending—further limits translational relevance. In clinical settings, cyclic stresses can induce screw loosening or fatigue failure, phenomena not captured in static biomechanical assays. Thus, while our findings elucidate immediate post-fixation stability, they cannot predict how screw length affects outcomes under repetitive loading or biological repair mechanisms. Future investigations should prioritize complex, clinically representative fracture models to deepen mechanistic insights. The sample size (n=7 per group) limits statistical power, increasing the risk of Type II error. Post-hoc power analysis indicated 58% power to detect a 0.5 mm displacement difference, underscoring the need for larger trials.



#### CONCLUSION

This study, employing a controlled sheep cadaveric fracture model, demonstrates that the integration of pedicle screws at the thoracolumbar fracture level significantly augments biomechanical stability in short-segment posterior spinal instrumentation systems. Notably, screw length—whether penetrating less than 50% (short) or exceeding 70% (long) of the vertebral corpus depth—did not yield statistically significant differences in stability metrics, including axial stiffness, load-to-failure resistance, or displacement under stress (\*p\* > 0.05 for all comparisons). These findings challenge conventional assumptions that longer screws inherently optimize construct rigidity by engaging denser anterior cortical bone. Instead, shorter screws achieved biomechanical parity while avoiding risks associated with excessive anterior protrusion, such as iatrogenic displacement of fracture fragments or inadvertent encroachment into critical anatomical spaces. While biomechanical equivalence is evident in controlled settings, the clinical durability of short screws remains unproven. Long-term in vivo studies are essential to assess how screw length influences outcomes. Prospective clinical trials should prioritize stratified randomization based on fracture morphology (e.g., AO Spine classifications) and bone quality (assessed via DEXA or CT Hounsfield units) to isolate the role of screw length in diverse patient cohorts.

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# Oral Presentations



*"Updates and New Horizons in Spinal Surgery"* May 22-25, 2025 / La Blanche Island, Bodrum





### **Ref No: 1053**

### FULL ENDOSCOPIC DECOMPRESSION IN GRADE 1 LUMBAR SPONDYLOLISTHESIS: DOES IT CAUSE INSTABILITY?

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**Aim**: This study aimed to evaluate whether full endoscopic decompression leads to postoperative instability in patients with Grade 1 lumbar spondylolisthesis and spinal stenosis. The goal was to assess the safety and efficacy of this minimally invasive technique in preserving spinal stability while providing effective neural decompression.

Material and Method: This retrospective study included 32 patients who underwent full endoscopic interlaminar decompression between January 2023 and October 2024. Inclusion criteria were: radiologically confirmed Grade 1 spondylolisthesis (Meyerding classification), MRI evidence of central or lateral recess stenosis, and clinical symptoms such as neurogenic claudication or radicular leg pain. Patients with previous lumbar surgery at the index level were excluded.All procedures were performed under general anesthesia via a full endoscopic interlaminar approach. Care was taken to preserve facet joints and minimize bone removal to avoid iatrogenic instability. Thirteen patients required two-level decompression; the remaining underwent single-level surgery. In 8 patients, discectomy was also performed due to concurrent lumbar disc herniation.Data collected included preoperative and 6-month postoperative VAS and ODI scores, dynamic lumbar radiographs, operative time, blood loss, and perioperative complications.

**Findings**: In this retrospective series of 32 patients with Grade 1 lumbar spondylolisthesis and concomitant spinal stenosis, full endoscopic interlaminar decompression was performed. Although the total number of patients was 32, decompression was carried out at 45 levels due to multilevel stenosis in 13 patients. The most frequently affected levels in multilevel cases were L4–5 and L3–4. Overall, the most commonly involved segment was L4–5 (n=24), followed by L3–4 (n=12) and L5–S1 (n=9).In 8 patients, discectomy was also performed due to coexisting lumbar disc herniation. The mean operative time was 69 minutes. Intraoperative bleeding was minimal in all cases. One patient developed persistent low back pain and radiographic instability postoperatively, requiring posterior instrumentation.

Another patient sustained a dural tear during surgery, which was not repaired but did not result in cerebrospinal fluid leakage or neurological deficits. One patient developed a postoperative epidural hematoma that was endoscopically debrided on the first postoperative day. This patient experienced no longterm neurological complications and showed good clinical improvement.No other infections, hematomas, or complications were observed. At the 6-month follow-up, 31 out of 32 patients (96.8%) reported significant relief in leg pain and improvement in functional status, based on VAS and ODI scores (Table 1).

**Result**: Full endoscopic decompression is a safe and effective technique in selected patients with Grade 1 spondylolisthesis and spinal stenosis. Most patients achieved favorable outcomes without evidence of postoperative instability.

**Keywords**: Endoscopic surgery, spondylolisthesis, spinal stenosis, instability, decompression

#### References

**Author Note:** Dear Editor. We respectfully submit our abstract titled "Full Endoscopic Decompression in Grade 1 Lumbar Spondylolisthesis: Does It Cause Instability?" for consideration as an oral presentation. This study includes a retrospective analysis of 32 patients who underwent full endoscopic interlaminar decompression for lumbar spinal stenosis associated with Grade 1 spondylolisthesis. Our findings suggest that this minimally invasive technique is both safe and effective, with a low complication rate and minimal risk of postoperative instability when facet preservation is prioritized. The inclusion of level-specific data and individual patient outcomes adds clinical relevance to our conclusions. We believe this study will contribute meaningfully to the ongoing discussion about the role of endoscopic surgery in degenerative spine conditions and would be of interest to the orthopedic and neurosurgical communities. Thank you for considering our work. Sincerely, Yusuf Bayram

*"Updates and New Horizons in Spinal Surgery"* May 22-25, 2025 / La Blanche Island, Bodrum





### **Ref No: 1107**

### THE EFFECT OF BRACE TREATMENT ON STRESS LEVEL AND QUALITY OF LIFE IN ADOLESCENT IDIOPATHIC SCOLIOSIS PATIENTS

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**Aim**: We wanted to determine the stress levels with BSSQ at the end of the first 6 months and the effect of treatment on quality of life in patients followed up with brace treatment for AIS.

**Material and Method**: 45 patients aged 10-16 years who were treated with bracing for AIS between 2024 and 2025 in our clinic and followed up for at least 6 months were retrospectively reviewed. The results of the questionnaire were collected with a face-to-face interview in the 6th month of treatment in outpatient clinic follow-up. The language of the questionnaire was Turkish. In the questionnaire, patients were asked 8 questions and classified as low stress level (17-24 points), medium stress level (9-16 points) and high stress level (0-8 points) according to the answers. Patients who had progressive progression of their curves despite treatment with a brace and who underwent surgical treatment (8 patients) and who did not comply sufficiently with brace treatment (5 patients) were exclude. The study included 32 patients, 21 females (65%) and 11 males (35%).

**Findings**: The mean age of the patients included in the study was 12.6 years. 5 patients did not comply with the brace treatment and the treatment was terminated. All of these patients were compatible with high stress level  $(4, 4 \pm 2, 07)$ . The mean stress score of the 32 patients who continued the treatment at the end of the first 6 months was  $9.18 \pm 5.22$ , which was compatible with moderate stress level. The stress levels of these 32 patients were distributed as follows: 0-8 points (high stress level) 15 people (46%), 9-16 points (medium stress level) 13 people (41%), 17-24 points (low stress level) 4 people (13%).

**Result**: Patients undergoing AIS brace treatment experience moderate to high levels of stress, which is associated with a decrease in quality of life. This stress may negatively impact

brace compliance and, consequently, treatment success. Further studies are needed to evaluate whether stress management strategies could improve adherence to brace treatment.

Keywords: brace, stress, adolescent, scoliosis

### **Ref No: 1421**

### IDIOPATHIC THORACOLUMBAR SCOLIOSIS TREATED AT ADULT AGE: TIMING OF SURGERY AND QUALITY OF LIFE

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**Aim**: Idiopathic thoracolumbar scoliosis (TLS) can progress during adulthood. Defining optimal timing for surgery remains difficult. Functional impairment is usually low in young adults. Early intervention and shorter fusion reduce lumbar motion partially but preserve the lumbosacral segment. Over time, impairment increases with age and comorbidities. Postponing surgery is at risk of extending fusion to the pelvis as the fractional lumbosacral curve progresses. The primary objective



was to assess how age influences quality of life (QoL) changes when operating adult TLS. Secondary objectives were to analyze the influence of the Lowest Instrumented Vertebra (LIV) and Relative Spinopelvic Alignment (RSA).

**Material and Method**: Prospective multicenter registry data of patients operated for idiopathic TLS with Cobb >40° and T11-L3 apex, and a minimum 2-year follow-up were analyzed retrospectively. SRS-22 and SF-36 scores were collected. The LIV was recorded, and RSA was calculated on radiographs. A linear regression mixed model with a random subject effect determined a potential cut off point for a patient's age at surgery based on SRS-22.

Findings: There were 310 patients, 269 females, with a median age of 50 (33.0-65.8) years. Linear regression indicated a plateau phase preoperative QoL between 30 and 42 years. Patients were grouped: <40, 40-60, and >60 years. Preoperative mean SRS-22 scores were 3.35 (<40), 2.88 (40-60), 2.73 (>60) and increased by 0.68, 0.66, and 0.80 at 2 years, respectively (p<0.05). Scores were significantly higher <40 years(p<0.001). The 6-month improvement between patients <40 and >60 was 0.28 (p=0.002), while younger patients had better baseline scores. Self-image increased most: 1.16 (<40), 1.08 (40-60), 1.14 (>60), without significant differences between groups. Pain improved by 0.53 (<40), 0.75 (40-60), and 1.07 (>60) with significant differences between 40-60 vs >60 (p=0.023) and <40 vs >60 (p<0.001). SRS-22 mental health and SF-36 (MCS) improved without significant differences between age groups. LIV didn't influence the amount of SRS-22 increase, but more proximal LIV was associated with higher pre- and postoperative scores. Patients with aligned RSA had significantly higher preoperative SRS-22 compared to malaligned: 3.11 vs 2.69 (p<0.001). Both groups had similar 2-year scores.

Potential cutoff points for age.



Pre- and postoperative SRS-22 score by age groups.



**Result**: Baseline QoL declines after 42 years. All age groups improved QoL at 2 years, mainly self-image. Pain improved mainly in patients >40. Patients <40 had better baseline and postoperative QoL. Long-term follow-up would be necessary to check the influence of aging. A collinearity between age and lumbosacral fusion with lower scores existed. Sagittal alignment influenced baseline scores.

**Keywords**: Idiopathic thoracolumbar scoliosis (TLS), Quality of life (QoL), SRS-22 score, Postoperative outcomes, Relative Spinopelvic Alignment (RSA)

*"Updates and New Horizons in Spinal Surgery"* May 22-25, 2025 / La Blanche Island, Bodrum





### **Ref No: 1461**

#### IN THE MANAGEMENT OF LOW BACK PAIN IN PATIENTS WHO HAVE UNDERGONE PREVIOUS LUMBAR SURGERY , IT IS IMPORTANT TO KEEP IN MIND CEVICAL PATHOLOGIES

Sümeyye Çoruh KAPLAN<sup>1</sup>

<sup>1</sup>Balıkesir Atatürk Şehir Hastanesi

**Aim**: Cervical, thoracic and lumbar spine segments degeneration together with associated spondylosis and narrow canal is a condition that we frequently observe, especially with increasing age. Although we review treatment options according to clinical findings, we prefer cervical decompression in the surgical treatment of spinal stenosis. Our aim in this study is to show that patients who have undergone lumbar surgery have reduced complaints such as low back pain and radiculopathy after cervical decompression and to emphasize that cervical pathologies should not be overlooked in various patients who are candidates for lumbar spine revision surgery.

**Material and Method**: We retrospectively analyzed 26 patients who presented to our clinic between 2020 and 2025, who had previously undergone lumbar surgery and who had both cervical myelopathy and lumbar pain and radiculopathy findings.5 patients were excluded from the study because we operated on both cervical and lumbar regions in the same session. We recorded the mean age of the patients as 55 years.12 female and 9 male patients, 16 of them underwent cervical decompression + lateral mass screwing, 5 of them underwent cervical laminoplasty. We performed cervical decompression + lateral mass screwing in 16 patients and cervical laminoplasty in 5 patients, 12 females and 9 males.We compared visual analog scale (VAS) scores preoperatively, early postoperative period (1-8 weeks) and late postoperative period (8-52 weeks).

**Findings**: In the data we analyzed, we noticed a significant decrease in the VAS scores of the patients in the early and late periods after cervical decompression (p<0.5). We continued the follow-up for an average of 2 years.

preoperative lumbar spinal stenosis



preoperative cervical spinal stenosis



postoperative servical decompression

**Result**: Tandem spinal stenosis may need to be kept in mind in cases of persistent low back pain and radicular symptoms that persist after previous back surgery or return after a period of time. In these cases, cervical compression is thought to be a factor in stretching the roots and therefore decompression improves the lumbar symptoms.

Keywords: tandem spinal stenosis

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### **Ref No: 1487**

#### FATTY INFILTRATION IN THE MULTIFIDUS PREDICTS SCREW-LOOSENING FOLLOWING SHORT-SEGMENT DECOMPRESSION AND FUSION: PROOF OF WHY WE SHOULD PROTECT AND REHABILITATE THE PARASPINAL MUSCLES

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**Aim**: Screw-loosening is a common instrumentation-related complication following fusion. Patients who present with pain and neurological symptoms due to screw-loosening require revision. It has been reported that fat-infiltrated and/or atrophied paraspinal muscles were associated with low back pain,

disability, radiculopathy, and instrumentation-related failures. However, there is limited and conflicting knowledge regarding the association of paraspinal muscles with screwloosening. In the present study, we aimed to identify whether fatty infiltration in the paraspinal muscles was associated with screw-loosening.

**Material and Method**: A retrospective analysis of the clinical and radiological data of the patients who underwent short-segment decompression and fusion for lumbar spinal stenosis (LSS) at a tertiary spine clinic between 2013 and 2023. Goutallier's classification system was used for grading fatty infiltration in the paraspinal muscles.

**Findings**: Patients with screw-loosening had fattier multifidus at the upper lumbar spine (particularly L2-L3, cephalad to the upper instrumented level of L3-L4) compared to those without screw-loosening. In univariate analysis fatty multifidus at L2-L3 level, elder age, and male sex had ORs of 1.509 (p = 0.008), 1.116 (p = 0.001) and 4.702 (p = 0.004), respectively. In multivariate analysis fatty multifidus at L2-L3 level, elder age and male sex had ORs 1.428 (p = 0.043), 1.109 (p = 0.003), and 5.911 (p = 0.004), respectively.

#### Table 1

 Table 1 Comparison of the patients with screw-loosening and those without screw-loosening in terms of fatty infiltration in paraspinal muscles through the whole lumbar spine

Paraspinal muscles	Patients with screw-loosening	Patients without screw-loosening	P value	OR (95% CI)	P value
Multifidus muscles (L)	$10.61 \pm 3.56$	8.69±3.05	0.012*	1.178 (1.021-1.360)	0.024*
Multifidus muscles (R)	$10.33 \pm 3.34$	$8.67 \pm 2.96$	0.022*	1.169 (1.006-1.357)	0.041*
Multifidus muscles (T)	$20.94 \pm 6.84$	$17.36 \pm 5.93$	0.015*	1.085 (1.008-1.168)	0.030*
Erector spinae muscles (L)	$9.00 \pm 3.19$	$8.35 \pm 3.02$	0.264	N/A	N/A
Erector spinae muscles (R)	8.88±3.77	$8.31 \pm 2.89$	0.365	N/A	N/A
Erector spinae muscles (T)	$17.88 \pm 6.88$	$16.66 \pm 5.82$	0.285	N/A	N/A
Psoas muscles (L)	$3.38 \pm 1.71$	$3.83 \pm 2.40$	0.582	N/A	N/A
Psoas muscles (R)	$3.27 \pm 1.93$	$3.50\pm 2.36$	0.901	N/A	N/A
Psoas muscles (T)	$6.66 \pm 3.49$	$7.33 \pm 4.50$	0.612	N/A	N/A

Abbreviations: OR=odds ratio, CI=confidence interval, L=left, R=right, T=total, N/A=not applicable, \*=significant at <0.05

Comparison of the patients with screw-loosening and those without screw-loosening in terms of fatty infiltration in paraspinal muscles through the whole lumbar spine



#### Table 2

umbar level	Paraspinal muscles	Patients with screw-loosening	Patients without screw-loosening	P value	OR (95% CI)	P va
1-L2	M (L)	1.66±0.97	1.20±0.76	0.022*	1.800 (1.051-3.081)	0.03
	M (R)	1.72±1.01	1.21±0.76	0.018*	1.923 (1.103-3.350)	0.02
	M (T)	3.38±1.94	2.41±1.49	0.016*	1.377 (1.045-1.814)	0.02
	ES (L)	$1.61 \pm 1.03$	1.25±0.68	0.110	N/A	N/A
	ES (R)	1.72±1.01	1.16±0.71	0.006*	2.175 (1.209-3.910)	0.00
	ES (T)	3.33±1.97	2.41±1.34	0.037*	1.409 (1.049-1.893)	0.02
	P(L)	0.50±0.51	0.45±0.62	0.507	N/A	N/A
	P(R)	0.55±0.51	0.36±0.57	0.078	N/A	N/A
	P(T)	1.05±0.99	$0.81 \pm 1.06$	0.281	N/A	N/A
-L3	M (L)	1.83±0.92	$1.30 \pm 0.71$	0.007*	2.133 (1.185-3.838)	0.01
	M (R)	1.83±0.92	1.27±0.69	0.003*	2.303 (1.257-4.218)	0.00
	M (T)	3.66±1.84	2.57±1.36	0.005*	1.509 (1.115-2.044)	0.00
	ES(L)	1.61±0.77	1.17±0.65	0.006*	2.209 (1.140-4.281)	0.01
	ES (R)	$1.61 \pm 0.91$	1.23±0.67	0.033*	1.838 (1.001-3.376)	0.05
	ES (T)	3.22±1.66	2.40±1.27	0.019*	1.438 (1.043-1.982)	0.02
	P(L)	$0.44 \pm 0.61$	0.59±0.69	0.443	N/A	N/A
	P(R)	$0.44 \pm 0.61$	0.49±0.65	0.853	N/A	N/A
	P(T)	$0.88 \pm 1.18$	1.08±1.25	0.539	N/A	N/A
-L4	M(L)	2.00±0.76	1.56±0.82	0.023*	1.831 (1.022-3.282)	0.04
	M (R)	1.94±0.87	1.57±0.76	0.094	N/A	N/A
	MO	3.94±1.55	3.13±1.54	0.037*	1.365 (1.004-1.857)	0.0
	ES (L)	1.55±0.85	1.37±0.73	0.320	N/A	N/A
	ES (R)	1.50±0.92	1.39±0.68	0.514	N/A	N/A
	ES (T)	3.05±1.73	2.76±1.32	0.392	N/A	N/A
	P(L)	0.66±0.59	0.80±0.66	0.465	N/A	N/A
	P(R)	0.61±0.77	0.80±0.75	0.294	N/A	N/A
	PCD	1.27±1.27	1.60±1.23	0.306	N/A	N/A
-L5	M(L)	2 50 ± 0.85	2.09±0.84	0.060	N/A	N/A
	M(R)	2 27±0 82	$2.11 \pm 0.81$	0.441	N/A	N/A
	MO	4.77 ± 1.51	4.20+1.60	0.100	N/A	N/A
	ES (L)	1.72±0.66	1.96±0.96	0.407	N/A	N/A
	ES (R)	1.66±0.76	1.92±0.90	0.249	N/A	N/A
	ESCO	3 38 ± 1 33	3 88 ± 1 81	0.313	N/A	N/A
	P(L)	$1.00 \pm 0.68$	1.05±0.71	0.775	N/A	N/A
	P(R)	0.83±0.61	0.95±0.65	0.492	N/A	N/A
	PCD	183+120	2 00+1 30	0.595	N/A	N/A
-51	M(L)	2.61±0.77	2 54±0 84	0.554	N/A	N/A
	M (R)	2.55±0.70	2.51±0.83	0.548	N/A	N/A
	MCD	5.16+1.42	5.05+1.64	0.458	N/A	N/A
	FS (L)	2 50+1 15	2 60+0 98	0.836	N/A	N/A
	ES (R)	2 38+1 14	2 61 +0 97	0.454	N/A	N/A
	ESCO	4 88 ± 2 21	521+188	0.666	N/A	N/A
	P(L)	077+042	0.94+0.73	0.467	N/A	N/A
	P(R)	0.83+0.51	0.90+0.59	0 713	N/A	N/A
	PCD	161+0.84	1 84+1 16	0.553	N/A	N/A
	* (4)	1.01 - 0.01	1.01=1.10	4.222		1972

Comparison of the patients with screw-loosening and those without screw-loosening in terms of fatty infiltration in paraspinal muscles at all lumbar levels

**Result**: Fatty infiltration in the multifidus muscle (particularly in the one at the cranial end of the fusion mass) is predictive for screw-loosening following short-segment lumbar decompression and fusion for LSS. Preserving multifidus in subjects is essential to prevent future long-term complications of spine surgery. Figure 1



Fig. 2 Intraoperative image from a lumbar spinal stenosis (LSS) case which demonstrates fatty infiltrated multifidus muscle at the cephalad part of the upper instrumented vertebra

Intraoperative image from a lumbar spinal stenosis (LSS) case which demonstrates fatty infiltrated multifidus muscle at the cephalad part of the upper instrumented vertebra

**Keywords**: paraspinal muscles, spine, surgery, screw-loosening, revision

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### Ref No: 1525

#### POSTOPERATIVE PROGRESSIVE ANTERIOR IMBALANCE: IS THERE A WAY TO STOP THE DOMINO EFFECT?

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**Aim**: Progressive postoperative anterior imbalance (PPAI) is characterized by a significant loss of global sagittal alignment, usually occurring in patients between 2 and 5 years after ASD surgery, despite spinal fusion. The underlying factors driving this process remain poorly understood. This study aims to identify factors associated with postoperative increases in relative spinopelvic alignment (RSA) and to evaluate surgical strategies that may mitigate PPAI progression.

**Material and Method**: For this retrospective analysis of a prospective multicenter database, we included adult spinal deformity patients who underwent panlumbar fusions of more than six levels, with a minimum follow-up of five years. The delta RSA ( $\Delta$ RSA) was calculated as the difference between the five-year postoperative RSA and the six-week (immediate) postoperative RSA. Excessive  $\Delta$ RSA was defined as values above the 75th percentile (>12.4°) and considered PPAI, and the cohort was divided into two groups accordingly. Univariate and multivariate analyses compared biological variables (age, BMI, osteoporosis, frailty index), preoperative and postoperative alignment parameters (T2-T12 kyphosis, RPV, RSA, and GAP Score), surgical techniques (UIV proximal to T6, ALIF, osteotomies, multiple rods, number of instrumented

levels, implant density), and mechanical complications and reoperations.

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**Findings**: A total of 145 patients with a five-year follow-up were included, with 90.3% female and a median age of 66 years. The median  $\Delta$ RSA was 7.58° (range: -13° to59°), with 24.8% of patients exhibiting excessive  $\Delta$ RSA (>75th percentile). Univariate and multivariate analyses found no association between PPAI progression and biological factors, sagittal realignment, or surgical strategy. The only variable significantly associated with excessive  $\Delta$ RSA was the occurrence of mechanical complications (OR = 7.54; p = 0.003). Consistently, the absence of mechanical complications was the only identified protective factor, even when analyzing groups with  $\Delta$ RSA <25th percentile.

Univariate and Multivariate Analysis of Factors Associated with Progressive Postoperative Anterior Imbalance (PPAI)

					95% C.I.f	or OR		
	В			df	Sig.	OR	Lower	Upper
UIV higher than T6	,742	1,105	,450	1	,502	2,100	,240	18,336
ALIF				1	,617	,676	,146	3,137
Osteotomy			3,807	1	,051	,307	,094	1,005
Double rod technique	-,275		,239	1	,625	,759	,252	2,290
N° Posterior Instrumented Levels	,044	,148		1	,769	1,044	,781	1,397
Mechanical Complications	2,020	,680	8,832	1	,003	7,536	1,989	28,548
Age at surgery			,374	1	,541	1,022	,952	1,098
BMI		,068		1	,313	,934	,818	1,066
Osteoporosis / Osteopenia	-1,369	,748		1	,067	,254	,059	1,103
Frailty Index		2,360		1	,689	,389	,004	39,659
Implant density			,014	1	,908	,999	,977	1,021
BL. T2-T12 Kyphosis		,024	2,425	1	,119	1,038	,990	1,087
6W. T2-T12 Kyphosis	-,042	,026	2,585	1	,108	,959	,911	1,009
BL. RPV		,071	,214	1	,644	1,033	,899	1,188
6W. RPV		,078	,740	1	,390	,935	,803	1,089
BL. RSA			,839	1	,360	1,042	,954	1,138
6W. RSA	-,074	,074	,983	1	,321	,929	,803	1,075
BL. GAP Score				1	,818	1,026	,827	1,273
6W. GAP Score	-,082			1	,560	,921	,699	1,214
Etiology of the deformity		,233		1	,169	,726	,460	1,146
Reoperations		.224		1	.946	1.015	.654	1.576

**Result**: Neither biological characteristics, surgical techniques, nor sagittal realignment appear to prevent PPAI progression. This phenomenon is primarily influenced by the presence of mechanical complications.

**Keywords**: Progressive postoperative anterior imbalance (PPAI), Adult spinal deformity (ASD), Postoperative alignment, Mechanical complications

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### **Ref No: 1554**

#### **EXTRUDED LUMBAR DISC MIGRATION: REPORT OF MULTI-CENTER CASE SERIES AND LITERATURE** REVIEW

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Aim: Lumbar disc herniation is one of the most frequently encountered conditions in neurosurgical practice. Disc herniations may remain contained within the annulus or, by completely rupturing the annulus, may extrude and exhibit migration. The aim of this study is to shed light on etiology by examining the factors that may lead to migration through a case series and a review of similar series in the literature.

Material and Method: Patient data for a total of 60 patients with "extruded lumbar disc migration" were retrospectively analyzed from three centers, with an equal number of male and female patients. The patients' ages and magnetic resonance (MR) images were evaluated to assess the lumbar disc level, degree and direction of migration, lumbar lordosis angle, side of the herniation, and axial location.

**Findings**: The mean age of the patients was  $47.25 \pm 12.67$ vears, with an equal gender distribution. The most frequently observed disc levels were L4-5 (41.7%), L5-S1 (36.7%), L3-4 (18.3%), and L2-3 (3.3%). The migration grades were distributed as follows: Grade 2 (33.3%), Grade 1 (30.0%), Grade 3 (25.0%), and Grade 4 (11.7%). In terms of migration direction, 75% of cases exhibited caudal (downward) migration, while 25% exhibited cranial (upward) migration. The average lumbar lordosis angle was measured as  $24.15 \pm 4.79$  degrees. The lesions were most frequently observed on the left side (53.3%) and in the subarticular region (58.3%). No significant relationship was found between migration direction and the other evaluated parameters (p > 0.05).

**Result:** Lumbar discs exhibiting migration were more frequently found in the lower lumbar region compared to the upper lumbar region. The likelihood of caudal migration is higher than that of cranial migration. A review of the literature indicates that patients with extruded discs demonstrating migration tend to have a lower lumbar lordosis angle compared to the normal population. In all cases, the extruded disc fragments always

demonstrated either craniolateral or caudolateral migration. The posterior longitudinal ligament was identified as an important anatomical barrier in preventing midline migration.



Fig. 2



Number graph of migration directions per level



Number graph of migration directions per age group

**Keywords:** disc herniation, extruded disc, cranial migration, caudal migration

Author Note: I was unable to edit the title of my submission numbered 5695 because the capital "I" letter was mistakenly used due to the Word program, and I was not familiar with the abstract submission system. I sent an email to spinecongress2025@ gmail.com to inform the comittee about the situation, but I have not received a response. Therefore, I felt the need to resubmit my corrected submission. I kindly request that my previous submission be disregarded and that my current re-submission be evaluated as an "oral presentation and full-text paper."

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### **Ref No: 1559**

### CLINICAL AND SURGICAL OUTCOMES OF FULL ENDOSCOPIC DISCECTOMY IN RECURRENT LUMBAR DISC HERNIATIONS

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**Aim**: The aim of this study was to evaluate the clinical and surgical outcomes of full endoscopic discectomy (FED) in patients with recurrent lumbar disc herniation (rLDH) and to compare the transforaminal and interlaminar approaches in terms of efficacy, safety, and patient satisfaction. The study also aimed to determine whether FED could serve as a reliable alternative to conventional revision techniques in complex recurrence cases.

Material and Method: This retrospective clinical study included 75 patients who underwent FED for rLDH between January 2024 and February 2025. Inclusion criteria were: age  $\geq$ 18 years, MRI-confirmed recurrence at the same level and side after prior discectomy (open, micro, or endoscopic), and availability of at least 6 months of follow-up.Exclusion criteria included multilevel herniations, spinal instability, infection, malignancy and emergent conditions such as cauda equina syndrome. All surgeries were performed by a single experienced spine surgeon using either the transforaminal or interlaminar approach, selected based on patient-specific anatomy and herniation level. A 25° rigid endoscope with a 4 mm optic and a 6.9 mm working channel was used.Clinical outcomes were assessed via Visual Analog Scale (VAS) for back and leg pain,Oswestry Disability Index (ODI), operative time, hospital stay, complication rates, recurrence/ reoperation rates, patient satisfaction and time to return to work. Statistical analyses were performed using SPSS v26.0.

**Findings**: The mean patient age was  $48.2 \pm 11.3$  years with 54% male participants.Most recurrences occurred at L4–5 (52%) and L5–S1 (41.3%).Transforaminal and interlaminar approaches were used in 64% and 36% of cases, respectively. Mean operative time was 76.8 minutes, mean incision length was 8.4 mm, and mean hospital stay was 0.3 days. The overall complication rate was 15.3%, including dural tears (8%), bleeding (5.3%), and nerve injury (2%).Significant clinical improvement was observed: VAS scores decreased from 6.9 to 2.6 (back pain) and 8.1 to 1.9 (leg pain); ODI improved from 58.2% to 18.2% at 6 months (p < 0.001). Recurrence and reoperation score was 8.3/10, and return-to-work time averaged  $4.3 \pm 2.1$  weeks. No

statistically significant differences were observed between the two surgical approaches in terms of outcomes or complications.

**Result**: Full endoscopic discectomy is a safe,effective and minimally invasive treatment modality for recurrent lumbar disc herniation.lt offers excellent clinical outcomes,low complication and reoperation rates and high patient satisfaction when performed by experienced surgeons.Both transforaminal and interlaminar approaches are viable options and approach selection should be tailored to the patient's anatomical characteristics.Further prospective,multicenter studies are needed to confirm these findings and establish broader generalizability.

Patient Characteristics and Surgical Data

Variable	Mean / Distribution
Number of Patients	75
Age (mean ± SD)	48.2 ± 11.3 years
Sex	54% Male / 46% Female
BMI (mean ± SD)	27.1 ± 3.2 kg/m <sup>2</sup>
Recurrent Level	52% L4-5 / 41.3% L5-S1 / 6.7% Other
Previous Surgery	60% Microdiscectomy / 30% Open / 10% Endoscopic
FED Approach	64% Transforaminal / 36% Interla- minar
Operative Time	76.8 ± 15.4 minutes
Incision Size	8.4 ± 1.3 mm
Length of Hospital Stay	$0.3 \pm 0.4$ days
Overall Complication Rate	15.3%
Dural Tear	8%
Bleeding	5.3%
Nerve Injury	2%
Recurrence Rate	8%
Reoperation Rate	5.3%
Return-to-Work Time	4.3 ± 2.1 weeks
Patient Satisfaction Score	8.3 ± 1.4 / 10

**Keywords**: Recurrent lumbar disc herniation, full endoscopic discectomy, transforaminal, interlaminar, minimally invasive spine surgery, clinical outcomes, revision spine surgery

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### Ref No: 1627

#### DETECTION OF FRACTURES IN THE THORACOLUMBAR VERTEBRAE USING U-NET TRANSFER LEARNING

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**Aim**: This study aims to minimize the dependency of clinicians on CT and MRI evaluation to diagnose thoracolumbar fractures by machine learning which enables the computer to detect the fractured and healthy vertebrae by scanning the radiology of patients.

**Material and Method**: A total of 100 patients with thoracic or lumbar fractures were included in the study. Computed tomography scans of the patients were evaluated and measurements were made on the vertebral corpus to differentiate between fractured and non-fractured vertebrae. In addition, a labeling program was used to label the vertebrae as 'fractured' and 'non-fractured'.Deep learning is performed, and U Net Architecture is used with the Focal Loss and Dice Loss function to handle the class imbalance problem. During the learning process, the training and testing sets were separated at a ratio of 80% to 20%. In addition, the train set was divided into a 20% validation set. The metrics of accuracy, F1, precision, recall, specificity, and ROC were used to evaluate the detection of fractures using the U-net.

**Findings**: The U-NET model demonstrated a high degree of accuracy, with a precision of 98.38%, and F1 score of 98.37%, a specificity of 92.48%, ROC 99%, and a recall of 98.4%. These metrics were obtained from the analysis of fracture detection in the thoracolumbar region. The analysis yielded a robust model, indicating the efficacy of the U-NET model in detecting fractures. The findings demonstrate the efficacy of U-Net in providing highly accurate and reliable segmentation for fracture detection, making it suitable for real-world applications in automatic inspection and fracture detection.

**Result**: The results of the study indicate that 98.4% total accuracy of machine learning on the detection process of a fractured vertebra may remove the dependency on doctor

evaluation to diagnose. This may help emergency doctors to diagnose by notifications after the CT shoot which may quicken the treatment of the patient.

Table-1

	Precision	Recall	Specifi- city	F1	Acc	Dice
Overall perfor- mance	0.9548	0.9213	0.9696	0.9373	0.9840	0.9556

This table summarises the performance of the machine and transfer learning artificial intelligence application in terms of sensitivity, specificity and precision.

**Keywords**: thoracolomber fracture, transfer learning, machine learning, computed tomography, Unet

### Ref No: 1673

#### HEMIVERTEBRA RESECTION IN CHILDREN BELOW 3-YEARS-OF-AGE: SAFETY PROFILE, CLINICAL AND RADIOGRAPHIC OUTCOMES

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**Aim**: Controversy exists regarding the most suitable age for hemivertebrae resection. Yet, the consensus would be to treat this congenital defect before compensatory scoliosis sets in, which ultimately results in a fixed deformity. Main concerns with early surgery include the unknown neurotoxic effects of anesthetics on the developing brain, difficulties in neuromonitoring, small-sized fragile pedicles, less secure

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fixation, and extensive bleeding. This study evaluates the safety, clinical, and radiological outcomes of patients with hemivertebra operated on before age 3 with a minimum of 2 years of follow-up.

**Material and Method**: Demographic and radiographic data were retrospectively analyzed. Coronal and sagittal curve magnitudes and balance were measured. Correction rates, complications, intraoperative blood loss, duration of surgery, and length of hospital stay were collected. Descriptive analyses were performed. Surgical techniques included type-3 hemivertebra resection, use of navigation for pedicle screws, and multi-rod (3-4) constructs performed by a specialized pediatric neuroortho surgical team.

Findings: 14 patients who had undergone 18 hemivertebrectomies with a minimum of 2 years of follow-up were included. Mean age at surgery was 29 (11-35) months. The mean follow-up was 64.6 (24-121) months. The mean preoperative segmental Cobb angle of the hemivertebra and C7PL-CSVL distance was 31.2°±7.4° and 11.4mm±8.9mm, respectively. The mean postoperative segmental Cobb angle was 4.0°±3.3°. The mean segmental Cobb angle at the latest follow-up was 5.1°±6.1°, resulting in an average correction rate of 85.1%±15.2%. Mean C7PL-CSVL at the latest follow-up was 16.4 mm ± 12.8 mm. The median intraoperative estimated blood loss was 175 (75-600), and operative time was 250 (180-480) minutes per hemivertebra, and the length of hospital stay was 4 (3-6) days. There was one patient with recurrent wound dehiscence necessitating implant removal 2 years after surgery, and one patient had superficial wound infection. None of the patients had implant failure, and all multi-rod instrumented patients used only a brace as external support.

**Result**: Hemivertebra resection in patients under age 3 results in low complication rates and provides favorable outcomes. Use of navigation, multi-rod constructs and specialized teams contribute to the procedure's safety in this age group.

**Keywords**: Hemivertebra resection, Pediatric spine surgery, Congenital spinal deformity, Radiological assessment, Postoperative complications

### Ref No: 1762

### UNILATERAL INTRAOPERATIVE NEUROMONITORING (IONM) MEP ALERTS IN CORD LEVEL SURGERIES FOR SEVERE SPINAL DEFORMITIES – ETIOLOGY AND RECOVERY PATTERNS

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**Aim**: IONM alerts are commonly encountered in corrective surgeries for severe spinal deformities. The purpose was to identify the causes and significance of unilateral alerts in complex spinal deformity surgery.

**Material and Method**: A prospective, multicentric cohort study in 20 international centers documented demographics, radiographic findings, and surgical events of patients undergoing complex spinal deformity surgery with EMG, SSEP, and MEP monitoring. A standardized data collection form recorded all IONM alerts, including events preceding alerts and corrective actions. A detailed neurological exam was conducted at baseline,

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post-op, and before discharge. IONM alert was defined as a loss of amplitude >50% from baseline in SSEP or MEP or sustained EMG activity lasting >10 seconds.

Findings: 349 of 555 patients underwent cord-level surgeries for severe spinal deformities. 57 patients had IONM alerts, with 44 unilateral MEP alerts (38 isolated, 6 combined with SSEP) occurring in 37 patients. The mean age was 21.4±15.6 years, and 70.3% were female. 75.7% had scoliosis with a mean Cobb angle of 77.6±24.8, and coronal DAR was 11.5±3.6. All had deformity apex at the thoracic spine, with T9 (24.3%) and T8 (21.6%) the most common levels. Intraoperative traction was utilized in 29.7% of cases. 34 patients (91.9%) had osteotomies, including 9 having 3-column osteotomies. Events before alerts included implant placement (18.4%), osteotomy/release (57.9%), rod placement (21.1%), traction (5.3%), and other (5.3%). Common responses included elevating blood pressure (36.4%), transfusing blood (20.5%), implant removal (18.2%), and steroids (18.2%). A traumatic surgical event was identified in 27 (61.4%) unilateral MEP alerts. Complete unilateral MEP loss occurred in 22.7%, >75% loss in 68.2%, and >50% loss in 9.1%. By skin closure, MEP signals recovered to near baseline in 68.2%, and 81.8% recovered to at least 50%. Of the 37 patients with unilateral MEP losses, 10 (27%) had de-novo deficits postop. with 1 patient suffering spinal cord syndrome. At discharge. 4 (10.8%) had neurological deficits.

**Result**: This study demonstrates that unilateral MEP alerts, with or without SSEP changes, will occur most frequently with osteotomies. 27% of patients with unilateral MEP alerts had early neurological deficits, decreasing to 10.8% at discharge. Appropriate surgical maneuvers led to partial or complete reversal of IONM signal loss. 70% of complete unilateral MEP alerts returned to baseline within 60 minutes of the causative event, and 82.1% of incomplete losses recovered to at least 50% by skin closure. Recognizing and responding to unilateral MEP alerts was linked to good outcomes in spinal deformity surgery.

**Keywords**: IONM alerts, Unilateral MEP alerts, Spinal deformity surgery, SSEP monitoring, Intraoperative neuromonitoring, Severe Spinal Deformities

### **Ref No: 1854**

#### UNRAVELING THE MIND-BODY CONNECTION: PSYCHOLOGICAL AND COPING PARADIGMS IN IDIOPATHIC SCOLIOSIS

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**Aim**: Idiopathic scoliosis is a spinal deformity that impacts both physical appearance and psychosocial well-being. The visible spinal curvature in idiopathic scoliosis often leads to body image dissatisfaction, which may impact mental health and adherence to treatment. Self-esteem and Cobb angle influence body image dissatisfaction in individuals with idiopathic scoliosis, with mediating effects from coping strategies and psychological inflexibility. This study, based on a retrospective analysis of a single-center database, investigates the relationship between self-esteem, Cobb angle, and body image dissatisfaction, with a specific focus on the mediating effects of body image coping strategies and psychological inflexibility.

**Material and Method**: This study included 150 individuals aged 11–40 with idiopathic scoliosis receiving outpatient treatment. Assessment tools included the Demographic and Medical Information Form, the Rosenberg Self-Esteem Scale, Body Image Disturbance Questionnaire—Scoliosis Version, Body Image Coping Strategies Inventory, and theBody Image Psychological Inflexibility Scale. Statistical analyses were performed using IBM SPSS 26.0, with mediation analysis conducted via the PROCESS v4.2 macro.

**Findings**: Mediation analysis revealed that the relationship between self-esteem and the personal subdimension of body image dissatisfaction related to scoliosis was mediated by the appearance-fixing subdimension of coping strategies (p<0.001) and body image psychological inflexibility (p<0.05) (Table 1). Similarly, the relationship between self-esteem and the social subdimension of body image dissatisfaction was mediated by appearance-fixing (p<0.05) and avoidance subdimensions

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(p<0.05), along with body image psychological inflexibility (p<0.05) (Table 2). Additionally, Cobb angle was significantly associated with the personal subdimension of body image dissatisfaction (p<0.05), but no mediating effects were observed in this relationship (Table 3).

#### Fig.1 Mediation Figures

#### Figure 1.

Self-Esteem- Appearance Fixing- Body Image Related to Scoliosis – Personal Subscale Mediation Model



#### Figure 2.

Self-Esteem- Body Image Psychological Inflexibility- Body Image Related to Scoliosis – Personal Subscale Mediation Model



#### Figure 3.

Self-Esteem- Appearance Fuxing- Body Image Related to Scoliosis – Social Subscale Mediation Model



#### Figure 4.

Self-Esteem- Avoidance- Body Image Related to Scoliosis - Social Subscale Mediation Model

turkishspine

AO



#### Figure 5.

Self-Esteem- Body Image Psychological Inflexibility- Body Image Related to Scoliosis – Social Subscale Mediation Model



### Fig 2. Mediation Tables

#### Table 1.

Mediation Analysis Table for the Relationship Between Self-Esteem and Body Image Dissatisfaction Related to Scoliosis - Personal Subscale

Effects				
(95% Confidence Interval)			Standa	rdized
	Beta	SE	LLCL	ULLC
Self-Esteem - BIDQ-S (P)	081*	.031	141,	020
Self-Esteem - AF	605**	.085	773,	-,437
AF → SiBl-K	.140**	.026	.089,	190
Total Effect (S-E-BIDQ-S (P))	-165**	.029	-222,	108
ladirect Effect (S-E ⇔AF ➡ BIDQ-S (P)	085*	.021	128 ,	045
Self-Esteem - BIDQ-S (P)	144***	.037	217,	071
Self-Esteem -A	443**	.046	534,	353
A → SÍBI-K	.049	.052	054,	.152
Total Effect (S-E → BIDQ-S (P))	-165**	.029	222,	108
Indirect Effect (S-E ➡ A ➡ BIDQ-S (P))	022	.021	064,	.018
Self-Esteen - BIDQ-S (P)	060	.035	-129.	.010
Self-Esteem - BIPI	-2.063**	.202	-2.462,	-1.66-
BIPI BIDQ-S (P)	.051**	.011	.029,	.073
Total Effect (SE -BIDQ-S (P))	165**	.029	-222.	-,108
Indirect Effect (SE + BIPI + BIDO-S (P))	106*	.028	- 162	052

\*p<.01, \*\*p<.001

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#### Table 2.

Mediation Analysis Table for the Relationship Between Self-Esteem and Body Image Dissatisfaction Related to Scoliosis - Social Subscale

Effects					
(95% Confidence Interval)			Standardized		
	Beta	SE	LICITILC		
Self-Esteen - BIDQ-S(S)	-111**	.034	178,	044	
Self-Esteem - AF	605**	085	773.	436	
AF	.102**	.028	.046,	.158	
Total Effect (SE -BIDQ-S (S))	173***	.030	234,	~113	
Indirect Effect (SE $\Rightarrow$ AF $\Rightarrow$ BIDQ-S (S))	062*	.020	-,106,	025	
Self-Esteem - BIDQ-S (S)	116**	.038	192.	040	
Self-Esteem - A	443**	.045	533,	-353	
A BIDQ-S (S)	.129*	.054	.021,	.236	
Total Effect (BS -BIDQ-S (S)	-173***	.030	234,	-,113	
Indirect Effect (BS $\Leftrightarrow$ K $\Leftrightarrow$ BIDQ-S (S))	057*	.027	113,	004	
Self Esteem - BIDQ-S (S)	034	03.5	104,	.036	
Self Esteem - BIPI	-2.063****	.201	-2.462.	-1.664	
BIPI $\longrightarrow$ BIDQ-S (S)	.067***	.011	.045,	.089	
Total Effect (SE -BIDQ-S (S))	173***	.030	234,	~113	
Indirect Effect (SE + BIP1+BIDQ-S(S))	-139*	.031	204,	081	

\*p<.03, \*\*p<.01, \*\*\*p<.001

#### Table 3.

Mediation Analyses of the Relationship Between Cobb Angle and Body Image Related to Scoliosis – Personal Subscale

The state

(95% Confidence Interval)			Standar	dized
	Beta	SE	LLCI	ULLC
Cobb - BIDQ-S (P)	.032*	.013	.004,	.059
Cobb AF	.083	.051	017,	.184
$AF \longrightarrow BIDQ-S(P)$	.167***	.022	.122,	.211
Total Effect (Cobb - BIDQ-S (P))	.046**	.016	.014,	.078
Indirect Effect (Cobb	.013	.008	017,	.031
Cobb - BIDQ-S (P)	.043**	.015	.013,	.074
Cobb - A	.013	.030	046,	.072
$A \longrightarrow BIDQ-S(P)$	.171 ***	.041	.088,	.253
Total Effect (Cobb → BIDQ-S (P))	.046**	.016	.014,	.072
Indirect Effect(Cobb ↔ K ↔ SlBl·K)	.002	.004	006,	.012
Cobb - BIDQ-S (P	.039**	.013	.012.	.067
Cobb -BIP1	.097	.137	174,	.365
BIPI - BIDQ-S (P)	.061***	.008	.045,	.078
Total Effect (Cobb → BIDQ-S (S))	.046**	.016	.014,	.078
Indirect Effect (Cobb + BIP1+ BIDO-S(S))	.006	.008	008,	.023

\*p<.05. \*\*p<.01. \*\*\*p<.001

**Result**: These findings enhance the understanding of body image dissatisfaction in individuals with idiopathic scoliosis and underscore the importance of integrating psychological interventions into scoliosis management. Future research should explore longitudinal effects and intervention-based approaches to address body image dissatisfaction and associated psychological challenges in scoliosis patients.

**Keywords**: Idiopathic Scoliosis, Body Image, Self-Esteem, Coping Strategies, Psychological Flexibility

### Ref No: 1874

#### LONG-TERM SURGICAL OUTCOMES OF CERVICAL DISC HERNIATION: INFLUENCE OF APPROACH, RADIOLOGIC PREDICTORS, SYMPTOM DURATION, AND DEMOGRAPHIC FACTORS

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**Aim**: The surgical management of cervical disc herniation involves anterior and posterior approaches, yet the long-term differences in clinical and radiologic outcomes remain unclear. This study aims to compare the postoperative outcomes of anterior versus posterior surgeries, evaluate radiologic predictors of symptom relief, and assess the impact of symptom duration, age, and sex on postoperative results.

**Material and Method**: A single-center retrospective study was conducted on 259 patients who underwent cervical disc surgery between 2020 and 2024 (205 posterior, 54 anterior). Preoperative and postoperative clinical parameters, including Neck Pain Score (NPS) for arm and neck pain and Neck Disability Index (NDI), were assessed. Radiologic predictors (cervical lordosis (CL), T1 slope, T1-CL mismatch, and cervical sagittal vertical axis (cSVA)) were analyzed for their correlation with symptom relief. Statistical analyses included paired t-tests, independent t-tests, and Pearson correlation, with p < 0.05 considered significant.

**Findings**: •Surgical Approach Comparison: Both anterior and posterior surgeries resulted in significant improvement in NPS and NDI (p < 0.001 for all measures), with no significant difference in postoperative outcomes between the two approaches (p > 0.05). •Radiologic Predictors: Preoperative cSVA (p = 0.031) and T1-CL mismatch (p = 0.001) were significantly correlated with postoperative symptom relief, particularly NDI improvement and neck pain reduction.•Symptom Duration: No significant correlation was found between symptom duration and postoperative outcomes (p > 0.05), indicating that surgery remains effective regardless of preoperative symptom chronicity.•Demographic Factors: Sex did not influence postoperative outcomes (p > 0.05), but older age was associated with worse postoperative NDI (p = 0.005), suggesting age-related functional limitations.

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Descriptive Statistics of The Patient Population

	Total Popula- tion	Posterior	Anterior
Number of Patients	259	205	54
Age (Mean ± 95% Cl)	43.44 ± 1.15	44.15 ± 1.33	40.76 ± 2.13
Sex			
Male	142	119	23
Female	17	86	31
Duration of Symptoms (Month) (Mean ± 95% Cl)	6.95 ± 1.85	7.16 ± 2.25	6.15 ± 2.51
Follow-up Du- ration (Month) (Mean ± 95% Cl)	30.88 ± 2.15	32.05 ± 2.32	26.44 ± 5.30
Body Mass Index (Mean ± 95% CI)	27.04 ± 0.76	26.66 ± 0.82	28.49 ± 1.90
Surgical Level			
Single Level	187	147	40
Multiple Level	72	58	14
ASA Status (n=146)			
1	40	31	9
2	103	78	25
3	3	3	0
Smoking Sta- tus (n=160)			
Yes	87	67	20
No	73	56	17

Pre and Postoperative Changes in Pain and Disability Scores with Anterior and Posterior Approaches

	Total Populati- on (n=152)	Posterior (n=117)	Anterior (n=35)
Numeric Pain Scale (Arm)			
Preop	8.10 ± 0.41	8.32 ± 0.43	7.37 ± 1.06
Postop	2.43 ± 0.50	2.24 ± 0.60	$3.09 \pm 0.87$
p-Values	<0.001	<0.001	<0.001
Numeric Pain Scale (Neck)			

Preop	7.45 ± 0.49	7.42 ± 0.57	7.57 ± 1.00
Postop	2.03 ± 0.38	1.87 ± 0.43	2.57 ± 0.85
p-Values	<0.001	<0.001	<0.001
Neck Disa- bility Index (NDI)			
Preop	51.44 ± 3.90	53.47 ± 4.42	44.68 ± 8.32
Postop	8.50 ± 2.30	8.35 ± 2.86	9.01 ± 3.14
p-Values	<0.001	<0.001	<0.001

Radiological Sagittal Parameters Associated with the Patient Reported Outcomes

Radiologic Parameter	Associated Outcome	Correlation Strength	P-Value
Preop cSVA	NDI Improve- ment	0.176	0.031
Preop CL	NPS Neck Improvement	0.219	0.007
Preop T1-CL	NPS Neck Improvement	0.258	0.001
Postop cSVA	NPS Neck Improvement	0.375	0.026

**Result**: This study highlights that both anterior and posterior approaches provide similar long-term clinical outcomes, reinforcing that surgical approach selection should be tailored to individual anatomical and pathological considerations. Preoperative sagittal alignment parameters (cSVA, T1-CL mismatch) play a crucial role in predicting postoperative functional improvement, suggesting their importance in preoperative planning. Contrary to expectations, longer symptom duration did not negatively impact surgical outcomes, emphasizing the efficacy of surgery even in chronic cases. Lastly, while sex was not a determinant of postoperative success, older age correlated with worse functional recovery, indicating the need for age-specific postoperative rehabilitation strategies. In a single-center cohort (2020-2024), preoperative sagittal alignment parameters, rather than symptom chronicity or sex, emerged as key predictors of surgical outcomes. These findings support the role of individualized patient selection and alignment correction strategies for optimizing long-term surgical results.

**Keywords**: Cervical Disc Herniation, Anterior Cervical Surgery, Posterior Cervical Surgery, Sagittal Alignment, Cervical Sagittal Vertical Axis, Patient Reported Outcome Measures

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### **Ref No: 1944**

#### COMPARISON OF 3D CORRECTION AND CLINICAL OUTCOMES OF LENKE 1A CURVES WHEN LIV IS SELECTED AS SV OR SV-1

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**Aim**: Lowest instrumented vertebra (LIV) selection is contraversial in Lenke 1A curves. Alignment of LIV in coronal, sagittal and transverse planes important for correction of overall scoliosis, as well as the alignment of uninstrumented lumbar curve. In this study we aimed to evaluate the three-dimensional correction and clinical outcomes of Lenke 1A curves, corrected with rod derotation (RD) maneuver, according to LIV level.

Material and Method: Prospectively collected data of 46 consecutive AIS patients with Lenke 1A scoliosis who were treated with posterior instrumentation and fusion were retrospectively evaluated. Patients were divided into two groups according to LIV level: stabile vertebra (SV) group (25 patients) and one level proximal to SV (SV-1) group (21 patients). Patients were compared pre- and postoperatively according to radiographic and clinical outcomes. Measured parameters in coronal plane were Cobb angle of thoracic curve, shoulder balance, coronal balance, LIV translation and LIV tilt; in sagittal plane, thoracic kyphsis, lumbar lordosis, sagittal balance, and distal junctional angle (Figure 1). Transverse plane analysis included rotational measurement of apical vertebra (AV), LIV and LIV+1 with computerized tomography (Figure 2). Clinical outcomes were evaluated with Scoliosis Research Society (SRS)-22 questionnaire. Surgical times were noted.





(A,B) Anteroposterior and lateral radiographs of 14 year-old girl with Lenke 1A scoliosis, showing 50° of main thoracic curve and 20° of thoracic kyphosis. (C,D) Postoperative radiographs at last follow-up showing T2-L2 fusion. The patient was fused to SV-1.



(A,B,C) Axial plane rotation assessment of a patient from SV group. LIV (L3) rotation angle decreased from  $6.5^{\circ}$  to  $5.1^{\circ}$ .

**Findings**: Mean age of the patients was 15.5 years. Mean followup time was 28 months (range 24-35 months). There were no statistically significant differences between two groups in terms of preoperative radiographic values. In both groups Cobb angle of thoracic curve, shoulder balance, LIV translation and LIV tilt improved significantly after the surgery. Postoperatively AV rotation decreased in both groups significantly. No significant change was observed in rotations of LIV and LIV+1 after the surgery. Clinical outcomes and surgical times were similar between groups.

**Result**: Selection of LIV as SV or SV-1 in Lenke 1A patients lead to similar results in terms of coronal and sagittal plane reconstruction, as well as AV and LIV rotation. With RD maneuver, an acceptable amount of rotation can be achieved at LIV and LIV+1. Radiologic and functional outcomes are satisfactory in both LIV levels. To save one more mobile segment, it seems reasonable to select LIV as SV-1 if possible, in order to obtain a well aligned LIV in all three planes.

**Keywords**: Adolescent idiopathic scoliosis, axial rotation, rod derotation, stable vertebra, lowest instrumented vertebra

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### **Ref No: 2051**

#### OUR RESULTS ON SUCCESS, COMPLICATIONS, AND PATIENT SATISFACTION IN THE TREATMENT OF UPPER CERVICAL SCHWANNOMAS WITH MINIMALLY INVASIVE SURGERY

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**Aim**: Spinal schwannomas are rare, benign nerve sheath tumors originating from Schwann cells. They are located intradurally and extramedullary. In this study, a minimally invasive technique, non-instrumented unilateral hemilaminectomy, was applied to patients diagnosed with intradural extramedullary schwannoma at the C2-3 level. Our aim was to evaluate the efficacy, complication rates and outcomes of this surgical method. The study, which was conducted on a total of 7 patients, aimed to monitor postoperative complications and patient satisfaction.

Material and Method: The study included 7 patients aged 18 years and over, who underwent surgery at the C2-3 level between January 1, 2019 and January 1, 2024, were pathologically diagnosed with schwannoma, and were in good general health. Those who had undergone cervical surgery in the past, those with a history of advanced osteoporosis or rheumatic disease, those with active infection, oncological patients, those who were not suitable for microsurgery, and those with psychiatric disorders were excluded from the study. In addition to routine neurological examinations during preoperative and postoperative check-ups, pain status was evaluated with parameters such as VAS (Visual Analog Scale), and functional status was evaluated with parameters such as ODI (Oswestry Disability Index) and NDI (Neck Disability Index). All patients underwent microscopic total tumor excision with non-instrumented, unilateral hemilaminectomy.

**Findings**: All patients were followed up for an average of 51 months. The average operation time was calculated as 90 minutes and the average blood loss was 150 mL. The average hospital stay was determined as 3 days. No complications were encountered during the follow-up. The average postoperative VAS score decreased from 6 to 3, and ODI and NDI results also showed significant improvement (p < 0.05). No recurrence was observed in any patient and no cervical kyphosis/instability developed.

**Result**: The results obtained show that schwannoma surgery performed with non-instrumented unilateral hemilaminectomy is a safe method. In our study, it was observed that there were no complications and a significant increase in the quality of life of the patients was achieved. Both the short duration of surgery and the hospital stay significantly reduced the risk of infection. In addition, complications such as instrument dysfunction and/ or infection were eliminated due to the lack of instrumentation. Since there was no artifactual effect in MRI, patient follow-ups were performed more healthily. Although the low number of patients and being a single center are limitations of our study, it should not be forgotten that upper cervical schwannomas are very rare pathologies.

Figure 1



Upper cervical schwannon preoperative and postoperative sagittal MR image

Keywords: Schwannoma, Spinal Tumors, Servical Spine

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### **Ref No: 2241**

### REVIEW OF THE USE OF TLIF CAGE IN LUMBAR SURGERY

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**Aim**: Lumbar spine diseases are disorders that seriously affect the daily lives of patients. There are many methods for their treatment. One of these is the TLIF CAGE method, which has become quite popular recently. The main reason for choosing this method is that it contributes to the formation of fusion in the postoperative period and helps spinopelvic balance. Thoracic kyphosis and lumbar lordosis are in mutual harmony in sagittal balance. The relationship between the pelvis and the spine in this harmony is called spinopelvic balance. In this study, we retrospectively examined the patients who underwent surgery in our clinic in the last 3 years by choosing TLIF CAGE, considering spinopelvic balance, and using preoperative and postoperative spinopelvic parameters.

**Material and Method**: We examined 25 patients who underwent TLIF CAGE between 2022 and 2025. We examined the patients' age, smoking, hypertension, diabetes mellitus, deficit, neurogenic claudication and TLIF dimensions. We had each patient take preoperative and postoperative scoliosis radiographs. We calculated the sagittal spinopelvic parameters lumbar lordosis (LL), sacral slope (SS), pelvic incidence (PI) and pelvic tilt (PT) using Surgimap. We wanted to see how close the postoperative spinopelvic parameters of our patients were to normal values.

**Findings**: 25 patients who were operated on using TLIF CAGE in our clinic were examined with Surgimap. The mean age of our patients was  $60\pm9.60$  (36-76). 13 of these patients (52%) had neurological deficits. NCM was  $47.8\pm39.3$ , median 50 (0-150). 16 of our patients (64%) were smokers. 20 of our patients (80%) had hypertension and 13 of them (52%) had diabetes mellitus. Before the operation, the majority of the patients (88%) were outside the normal LL range. After the operation, this rate improved significantly and 64% of the patients reached normal limits.

**Result**: This retrospective study showed us that there were improvements in spinopelvic parameters compared to the preoperative period. Especially when preoperative and postoperative comparisons were made, it showed that there was a significant regression in the patients' clinical complaints and neurological complaints. It was seen that TLIF CAGE contributed to the fusion at a visible rate. In conclusion, this study showed us that when more comprehensive studies and articles were examined, the use of TLIF CAGE was beneficial in terms of both providing stability and helping the fusion and reducing the clinical complaints in the patients. It was seen that it provided significant benefit especially in bringing the LL angles of the patients to the normal range.

PREOP AND POSTOPERATIVE SCOLIOSIS RADIOGRAPHS



Fig.1 Preoperative and postoperative scoliosis radiographs of a patient to whom we placed a TLIF CAGE.

Keywords: TLIF CAGE, spinopelvic parameters, fusion

<u>Author Note</u>: Hope, There Were Deficient Things In The Previous Notification We Sent, This Is Our Current Notification. Do Not Offend Me. Review Of The Use Of Tlif Cage In Lumbar Surgery

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### Ref No: 2261

#### C1-C2 FIXATION AFTER VERTEBRAL ARTERY MOBILIZATION IN A PATIENT WITH BASILAR INVAGINATION

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<sup>1</sup>Dicle University Faculty of Medicine Department of Neurosurgery

**Aim**: In patients with an indication for posterior C1-C2 fixation, the presence of an aberrant vertebral artery traversing the surgical field may complicate the procedure. In such cases, careful mobilization of the artery and the creation of a safe anatomical corridor can allow for successful completion of the fixation.

Material and Method: A 39-year-old female patient presented with complaints of headache, dizziness, weakness and numbness in both upper and lower extremities, and dysphagia. Brain and cervical magnetic resonance imaging (MRI) revealed basilar invagination. Computed tomography (CT) showed a congenital absence of the C1 lamina, and CT angiography demonstrated that the right vertebral artery followed an aberrant course posterior to the C1 pedicle. Additionally, the anterior arch of the C1 vertebra was found to be fused with the clivus. Cranial invagination of the odontoid process was observed to cause compression of the spinal cord at the craniocervical junction. Based on these findings, a posterior surgical approach was planned. During surgery, the right vertebral artery, which coursed abnormally posterior to the C1 pedicle, was carefully dissected and mobilized, and a new anatomical corridor was established to ensure a safe operative field. Following adequate decompression of the spinal cord, bilateral pedicle screws were placed at the C1-C2 levels, and autologous bone graft was inserted into the joint space. Finally, a Teflon spacer was placed between the vertebral artery and the surgical field to ensure vascular isolation.

**Findings**: In the postoperative period, the patient demonstrated complete resolution of extremity weakness and headache, and it was noted that she no longer dropped objects from her hands. Partial improvement in dizziness was observed; however, dysphagia persisted. Postoperative MRI revealed reestablishment of cerebrospinal fluid (CSF) space both anterior and posterior to the spinal cord.



Preoperative MRI image



**Result**: In patients with craniovertebral junction anomalies, such as basilar invagination, who require surgical intervention, the presence of the vertebral artery within the surgical field may pose technical challenges to C1-C2 fixation. In such cases, careful mobilization of the vertebral artery and the creation of a new anatomical corridor can allow for screw placement at the relevant levels, resulting in a more robust fixation. This approach not only enhances stability but also provides a favorable biomechanical environment for successful fusion.



**Keywords**: Vertebral artery mobilization, Basilar invagination, C1-C2 fixation

Preoperative trajectory of the vertebral artery

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### **Ref No: 2320**

ERECTOR SPINAE COULD BE THE GAME CHANGER IN SURGICAL DECISIONMAKING IN PATIENTS WITH LUMBAR SPONDYLOLISTHESIS: A CROSS-SECTIONAL ANALYSIS OF AN AGE-, SEX-, SUBTYPE-, LEVEL-MATCHED PATIENTS WITH SIMILAR SPINOPELVIC PARAMETERS RECEIVED SURGICAL OR CONSERVATIVE MANAGEMENT

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**Aim**: In this study we aimed to identify whether paraspinal muscle morphology could play a role in surgical decision making in patients with lumbar spondylolisthesis.

**Material and Method**: We conducted a cross-sectional analysis of a prospectively collected database between January 2013 and May 2023. Consecutive women and men, who visited our outpatient clinics with chronic LBP, neurogenic claudication, and had lumbar spine magnetic resonance imaging (MRI) for their complaints were included into the preliminary dataset. We compared the patients who had conservative management (conservative group) or underwent surgery for lumbar spondylolisthesis (surgical group) in terms of intervertebral disc degeneration, end-plate changes, fatty infiltration in the paraspinal muscles and spinopelvic parameters.

#### Figure 1

Assessment of fatty infiltration in the paraspinal muscles in a patient with lumbar spondylolisthesis who received conservative management. L1-L2, L2-L3, and L5-S1 disc levels: Goutallier scores of the multifidus, erector spiane and psoas muscles were 2, 2, and 1, respectively. L3-L4 and L4-L5 disc levels: Goutallier scores of the multifidus, erector spinae and psoas muscles were 3, 2, and 2, respectively

**Findings**: Conservative and surgical groups were similar in terms of severe IVDD and Modic changes at any lumbar level. Surgical group had significantly fattier erector spinae compared to the conservative group. Regression analysis and ROC analysis revealed an OR of 1.088 and a cut-off value of 17 points for fatty infiltration in the erector spinae to predict which patient could undergo surgery for lumbar spondylolisthesis.

Fig. 1 Assessment of fatty infiltration in the paraspinal muscles in a patient with lumbar spondylolisthesis who received conservative management. L1-L2, L2-L3, and L5-S1 disc levels: Goutallier scores of the multifidus, erector spiane and psoas muscles were 2, 2, and 1, respectively. L3-L4 and L4-L5 disc levels: Goutallier scores of the multifidus, erector spinae and psoas muscles were 3, 2, and 2, respectively



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#### Table 1

Table 1 Comparison of the conservative group with the surgical group in terms of severe intervertebral disc degeneration and presence of Modic

Lumbar level	Mild-to-mode	rate IVDD	Severe IVE	ievere IVDD P value Modic change absent		absent	Modic change present		P value	
Conservative Su group gru (n=32) (n:	Surgical group (n=32)	Conserva- Surgical tive group group (n=32) (n=32)		Conservative Su group gro (n=32) (n	Surgical group (n=32)	Conservative group (n=32)	Surgical group (n=32)	_		
L1-L2	29 (90.6)	28 (87.5)	3 (9.4)	4(12.5)	1.000	31 (96.9)	32 (100)	1 (3.1)	0 (0)	1.000
L2-L3	28 (87.5)	27 (84.4)	4 (12.5)	5 (15.6)	1.000	30 (93.8)	32 (100)	2 (6.2)	0(0)	0.492
L3-L4	27 (84.4)	27 (84.4)	5 (15.6)	5 (15.6)	1.000	26 (81.2)	28 (87.5)	6 (18.8)	4(12.5)	0.491
L4-L5	25 (78.1)	22 (68.8)	7 (21.9)	10 (31.2)	0.396	26 (81.2)	25 (78.1)	6 (18.8)	7 (21.9)	0.756
L5-S1	16 (50)	18 (56.2)	16 (50)	14 (43.8)	0.616	20 (62.5)	25 (78.1)	12 (37.5)	7 (21.9)	0.171

Abbreviations: IVDD=intervertebral disc degeneration, n=number of subjects, ()=numbers in brackets represent percentage

Comparison of the conservative group with the surgical group in terms of severe intervertebral disc degeneration and presence of Modic changes

#### Table 2

 
 Table 2 Comparison of the conservative group with the surgical group in terms of spine degeneration and fatty infiltration in paraspinal muscles

	Conservative	Surgical group	P value
	group $(n - 32)$	(n=32)	
Total pages second	(n=32)	15.00 + 2.01	0.005
Total psoas score."	$14.90 \pm 5.94$	$15.00 \pm 5.91$	0.995
Total multifidus score*	$24.71 \pm 8.12$	28.41 ± 8.19	0.072
Total erector spinae score*	$17.81 \pm 6.37$	22.09 ± 7.96	0.036*****
Total paraspinal muscle score*	59.93 ± 17.66	$65.50 \pm 17.67$	0.242
Total Modic score**	$1.75 \pm 1.45$	$1.09 \pm 1.05$	0.064
Total IVDD score***	$13.78 \pm 3.31$	$13.03 \pm 3.23$	0.148
Total score****	$75.46 \pm 19.61$	$79.62 \pm 17.90$	0.401

Abbreviations: n=number of subjects, IVDD=intervertebral disc degeneration, \*= calculated at each level and each side of corresponding intervertebral disc according to Goutallier classification, \*\*= calculated as total of Modic type changes (I as 1, II as 2, and III as 3) at each corresponding disc, \*\*\*= calculated as total Pfirrmann score (each grade corresponded to the same numerical score as grade 1, 1 point; grade 2, 2 points; grade 3, 3 points; grade 4, 4 points; grade 5, 5 points), \*\*\*\*= total score of paraspinal muscles, Modic changes and IVDD, \*\*\*\*\*= statistically significant

Comparison of the conservative group with the surgical group in terms of spine degeneration and fatty infiltration in paraspinal muscles

**Result**: Each 1-point increment in fatty infiltration in the erector spinae at any lumbar level increased the likelihood of surgery by 8%. Lumbar spondylolisthesis patients with fatty infiltration score for erector spinae at or above 17 were more likely to have surgery. We recommend clinicians to focus on improving erector

spinae muscles in patients with lumbar spondylolisthesis.

**Keywords**: low back pain, paraspinal muscles, spondylolisthesis, surgery, erector spine

**Ref No: 2352** 

#### RADIOLOGIC, SURGICAL AND CLINICAL OUTCOMES OF PATIENTS OPERATED FOR SPINAL SCHWANNOMA: A SINGLE CENTER STUDY

<u>Arda Topçu</u><sup>1</sup>, Jülide Hazneci<sup>1</sup>, Pınar Kuru Bektaşoğlu<sup>1</sup>, Erhan Çelikoğlu<sup>1</sup>

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**Aim**: Spinal schwannomas, the most common intradural extramedullary tumors, originate from the myelin sheath of peripheral nerves. They are benign tumors and seen in men and women with equal prevalence in the age range of 35-65 years. In this study, we evaluated the radiologic, surgical, and clinical outcomes of spinal schwannomas operated on in our clinic.

**Material and Method**: Cases operated for spinal schwannomas between 2014 and 2024 in our clinic were retrospectively analyzed. Preoperative and postoperative clinical, radiologic, and surgical results were evaluated. Radiologic evaluation was performed with contrast-enhanced magnetic resonance imaging (MRI).

**Findings**: This study included 39 patients; 20 patients were male, and 19 were female. The age range was 23-73 years, with a mean age of 45 years. One patient was operated on 3 times for spinal schwannoma, one patient had postoperative residuals on MRI, but 37 patients had no postoperative residuals. The mean ki-67 index of schwannoma cases was 2%. Schwannomas were located at the lumbar region in 21 cases, cervical region in 8 cases, thoracic region in 8 cases, and sacral region in 1 case.

**Result**: Spinal schwannomas are good prognostic tumors that can be completely removed without causing additional neurological deficits and thus do not require additional treatment.

Keywords: spinal schwannoma, surgery

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### **Ref No: 2368**

#### COMPARATIVE ANALYSIS OF IDEM AND INTRAMEDULLARY SPINAL TUMORS: CLINICAL AND SURGICAL OUTCOMES

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**Aim**: Intramedullary and intradural extramedullary (IDEM) spinal tumors are distinct clinical entities, each characterized by unique clinical presentations, surgical complexities, and prognosis. Due to their anatomical locations and growth patterns, these tumors may require specific surgical strategies and management approaches. The patient data reviewed in this study were collected from surgeries performed between 2012 and 2024 in a single center. This study aimed to retrospectively analyze and compare clinical outcomes, recurrence rates, surgical complication rates, and treatment strategies between IDEM and intramedullary spinal tumors.

**Material and Method**: A retrospective cohort study was conducted, analyzing data from 256 spinal tumor surgeries performed on 234 unique patients. The cohort was categorized into IDEM(n=173) and Intramedullary(n=83) tumor groups based on tumor location relative to the spinal cord. Clinical outcomes assessed included postoperative functional status measured by the McCormick and Karnofsky performance scales. Additionally, recurrence rates, gross total resection (GTR) rates, requirement for additional treatments (chemotherapy, radiotherapy, or reoperation), and incidence of surgical complications were evaluated. Statistical analyses were conducted using Mann-Whitney U tests for continuous variables and Chi-square tests for categorical variables, with statistical significance set at p<0.05.

**Findings**: Significant differences were observed between the two groups. Postoperative functional outcomes were notably superior in the IDEM group, with significantly lower mean McCormick scores ( $1.58\pm0.12$  vs.  $2.11\pm0.23$ , p<0.001) and higher Karnofsky performance scores ( $84.09\pm2.67$  vs. 77.23±4.30, p=0.002). The IDEM group also demonstrated significantly higher rates of GTR (85.55%) compared to the intramedullary group (72.29%, p<0.001). Furthermore, recurrence rates were notably higher among intramedullary tumor patients (6.02%) compared to IDEM patients (2.31%). Additional treatments were required more frequently in intramedullary tumor cases (19.28%) compared to IDEM cases (13.87%), although this difference did not reach statistical significance. Both groups had similar Surgical complication rates (8.67% IDEM vs. 8.43% Intramedullary). Anatomically, IDEM tumors were predominantly localized in the thoracic (67) and lumbar regions (67), while intramedullary tumors were located in the cervical (42) and thoracic regions (31).

Descriptive Statistics of the Patient Population

Metric	Total Popu- lation	IDEM	Intrame- dullary
Total Surgeries	256	173	83
Unique Patients	234	157	80
Age (Mean ± 95% CI)	42.93 ± 2.28	45.14 ± 2.92	38.30 ± 3.43
<18	17	11	6
>18	239	162	77
Sex			
Male	111	72	39
Female	145	101	44
Tumor Location			
Cervical	76	34	42
Thoracic	98	67	31
Lumbar	77	67	10
Sacrum	2	2	0
Extent of Resection			
GTR	208	148	60
Subtotal	32	15	17
Biopsy	16	10	6
Follow-up Duration (Mean ± 95% Cl)	35.35 ± 4.48	35.51 ± 5.44	35.02 ± 8.06
McCormick Postopera- tive Mean ± 95% Cl	1.75 ± 0.11	1.58± 0.12	2.11 ± 0.23
Karnofsky Postoperati- ve Mean ± 95% Cl	81.85 ± 2.29	84.09 ± 2.67	77.23 ± 4.30
Recurrence Rate (%)	3.52%	2.31%	6.02%
Additional Treatment (%)	15.62%	13.87%	19.28%
Complication Rate (%)	8.59%	8.67%	8.43%



Distribution of the Pathologies According to the Tumor Location

Patology	Total	IDEM	Intramedullary
Meningioma	53	53	0
Schwannoma	53	53	0
Ependymoma	39	7	32
Myxopapillary Ependymoma	16	16	0
Mature Terato- ma /Lipoma	15	9	6
Metastasis	12	5	7
Hemangiob- lastoma	11	1	10
Astrocytoma	10	0	10
Arachnoid Cyst	8	7	1
Cavernoma	6	1	5
AVM	6	1	5
Cyst, Other	5	3	2
Other*	22	17	5
* Other Inclu- des:		IDEM (Fibro- lipoma, Me- dulloblastoma, Neurofibroma, Diffuse Lep- tomeningeal Glioneuronal Tumor, AVF, Solitary Fibrous Tumor, Epidermoid Tuor, Para- ganglioma, Choroid Plexus Papilloma, Myxoid Stro- mal Tumor)	Intramedullary (Granulocytic Myeloid Sar- coma, Gang- lioneuroma, Diffuse Lep- tomeningeal Glioneuronal Tumor, Diffuse Midline Glio- ma, Traumatic Neuroma)

Comparative Analysis of IDEM and Intramedullary Tumors

	IDEM	Intramedullary	P-value
Postoperative Mccormick Score	1.58± 0.12	2.11 ± 0.23	<0.001
Postoperative Karnofsky Score	84.09 ± 2.67	77.23 ± 4.30	0.002
GTR Rates	85.55%	72.29%	<0.001

**Result**: The findings from this retrospective analysis highlight significant clinical and surgical differences between IDEM and intramedullary spinal tumors. Superior postoperative functional outcomes, higher GTR rates, and lower recurrence rates observed in the IDEM group suggest a comparatively favorable prognosis. These results underscore the critical importance of accurate preoperative diagnosis, careful surgical planning, and tailored postoperative studies are needed to optimize surgical techniques and enhance clinical outcomes, particularly for intramedullary tumors, given their higher complexity and increased likelihood of recurrence.

**Keywords**: Spinal Tumors, Intradural Extramedullary Tumors, Intramedullary Tumors, McCormick Score, Clinical Outcomes

### Ref No: 2391

#### TRANSFORAMINAL INJECTION IN LOW-GRADE SPONDYLOLISTHESIS AND DISC HERNIATION: AN ALTERNATIVE FOR PAIN MANAGEMENT

Sezer Onur Gunara<sup>1</sup>

<sup>1</sup>Bower Private Hospital, Diyarbakir/Turkey

**Aim**: Foraminal narrowing may occur secondary to spondylolisthesis. Concurrent disc herniation at the affected level can further exacerbate this narrowing, contributing to the onset of foraminal stenosis symptoms in patients. In cases with foraminal stenosis not severe enough to require surgery but unresponsive to conservative treatments, transforaminal injection is an effective modality for pain management. This study investigates the efficacy of transforaminal injection therapy in patients with low-grade spondylolisthesis and disc herniation who experience pain and reduced quality of life.

**Material and Method**: Between July 2022 and December 2024, transforaminal injections were administered to 146 patients with Meyerding grade 2 or lower spondylolisthesis and concomitant disc herniation, who were not considered candidates for surgery, at Gaziantep Şehit Kamil State Hospital and Diyarbakır Private Bower Hospital. Among the patients, 84 underwent bilateral injections, while 62 received unilateral injections. Each injection consisted of 3 mL of lidocaine and 4 mg of dexamethasone.The

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patients' VAS and ODI scores were evaluated at 1 day, 1. month, 3. month, 6. month, and 12. month after the procedure.

**Findings**: The mean pre-treatment VAS score was  $8.15 \pm 0.92$ . with the following scores at subsequent time points: 1. month,  $3.04 \pm 1.78$ ; 3. month,  $3.48 \pm 0.45$ ; 6. month,  $4.12 \pm 0.61$ ; and 12. month, 4.6 ± 0.84. The mean pre-treatment ODI score was 74.17  $\pm$  8.47, with the following scores at subsequent time points: 1. month, 29.04 ± 6.78; 3. month, 33.28 ± 7.65; 6. month, 41.42  $\pm$  7.21; and 12. month, 42.34  $\pm$  4.34. The differences in mean VAS and ODI scores between pre-treatment and post-treatment evaluations were statistically significant (p<0.005).On follow-up MRI scans taken at 6. month and beyond, 54 patients (36.9%) showed a reduction in disc protrusion. Although this result was not statistically significant, increasing the number of procedures performed could potentially yield significant findings. During the follow-up, 8 patients were observed to have no reduction in pain, and 4 of these patients subsequently required surgical intervention.

**Result**: Foraminal stenosis secondary to spondylolisthesis and lumbar degenerative disc disease can significantly impair quality of life due to pain. As demonstrated in our study, transforaminal injections may offer an effective approach for pain control in patients with foraminal stenosis who do not respond to conservative treatments, enabling them to resume their active lifestyles. However, additional research is required to further evaluate this treatment.

**Keywords**: Transforaminal, Injection, Spondylolisthesis, Disc Herniation, VAS-ODI

#### **References**

**Author Note**: Dear Editor I am hopeful that my oral presentation on the effectiveness of transforaminal injection therapy will be accepted. The presentation explores the therapeutic potential of transforaminal injections in patients with lowgrade spondylolisthesis and disc herniation, providing valuable insights into a non-surgical approach to pain management. Thank you for considering my submission. I look forward to your response. Sincerely yours: Sezer Onur Gunara

### **Ref No: 2406**

#### POST-OPERATIVE SPINAL INFECTIONS: RISK FACTORS, DIAGNOSTIC INDICATORS, AND OUTCOMES OF A MULTIMODAL TREATMENT ALGORITHM

Serkan Civlan<sup>1</sup>, <u>Nevzat Doğukan Erbek</u><sup>1</sup>, İlker Kiraz<sup>1</sup>, Emrah Egemen<sup>1</sup>, Mehmet Erdal Coşkun<sup>1</sup>

<sup>1</sup>Pamukkale University

**Aim**: To identify patient- and procedure-related risk factors for post-operative spinal infection and to evaluate the effectiveness of a structured, step-wise treatment pathway at a single tertiary centre.

**Material and Method**: Thirty-six adults treated for post-operative spinal infection between January 2014 and January 2018 were retrospectively analysed. Demographics, comorbidities, operative details, imaging findings, microbiological data, and serial laboratory indices—including white-blood-cell count, C-reactive protein, erythrocyte sedimentation rate, and the neutrophil-to-lymphocyte ratio (NLR)—were collected. Infections were classified as early-onset ( $\leq$  30 days) or late-onset (> 30 days) and as superficial soft-tissue or deep (osteomyelitis, discitis, epidural or psoas abscess). Management combined staged debridement, pressurised irrigation, closed suction irrigation—drainage, selective implant removal, vacuum-assisted closure, flap reconstruction, hyperbaric oxygen therapy, and ultrasound-guided abscess drainage. Categorical and continuous variables were compared with non-parametric tests (p < 0.05).

Findings: Pre-operative comorbidities were common: hypertension in 12 patients (33 %); coronary artery disease in 10 (28 %); immunosuppression in 10 (28 %); diabetes mellitus in 9 (25 %); and active smoking in 9 (25 %). Twentythree patients (64 %) carried at least two of these factors. Instrumented multilevel or revision procedures accounted for 72 % of index operations, with a mean operative time of 273  $\pm$  127 minutes. Early-onset infection predominated (72 %) and typically presented with wound discharge, whereas lateonset infection manifested chiefly as isolated pain. C-reactive protein and erythrocyte sedimentation rate were elevated in every patient; however, NLR rose earlier and normalised more rapidly, peaking at 7.7  $\pm$  5.1 in early infections before falling with therapy. Overall culture positivity was 69.4 %, led by Escherichia coli and coagulase-negative staphylococci. Deep infection required significantly longer intravenous (38.5 vs 17.8 days) and oral (97.8 vs 17.3 days) antibiotic courses and resulted in
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extended hospitalisation (67.1 vs 28.4 days) compared with superficial infection (all p < 0.05). Superficial infection was strongly associated with prolonged operative duration (mean 253 minutes; p = 0.040).

**Result**: Thorough peri-operative optimisation, prompt recognition, and an integrated treatment algorithm achieved satisfactory control of post-operative spinal infection. The present data contribute to the growing evidence on infection risk and management in spinal surgery and underscore the need for further prospective research in this field.

Keywords: spinal surgery, surgical wound infection

#### **References**

<u>Author Note</u>: Dear Scientific Committee, Please accept our abstract, "Post-operative Spinal Infections: Risk Factors, Diagnostic Indicators, and Outcomes," for oral presentation at TOD congress 2025. We retrospectively analysed 36 adult cases treated at a tertiary centre, outlining the principal patient- and procedure-related factors associated with infection and summarising treatment results. Thank you for your consideration.

## **Ref No: 2458**

#### DOES VBT CAUSE DISC AND FACET JOINT DEGENERATION? AN MRI STUDY WITH MINIMUM 5-YEARS FOLLOW-UP

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**Aim**: VBT is believed to prevent disc and facet degeneration due to its less rigid nature. While VBT's flexibility may be advantageous, the potential for compression-induced degeneration needs further research. The aim of this study was to analyze the changes in the intermediate and adjacent levels at least 5 years after surgery.

**Material and Method**: Demographic, perioperative, clinical, and radiographic data were collected. Skeletal maturity and height were assessed at each follow-up. Curve behavior and mechanical complications were recorded. A whole spine MRI was obtained preoperatively on a routine basis. A follow-up MRI (between T2-S1) was obtained at a minimum of 5 years postop. Disc and facet scores were compared using McNemar's Test and Related Samples Marginal Homogeneity Test.

Findings: Out of the first 49 consecutive patients operated on between 2014 and 2018, 35 (71.4%) were included. 34 (97%) were female. Mean age was 12.6 (9.5–16). Median Sanders score was 4 (1-7). The mean preoperative major curve was 49 (40-73) degrees. 28 had thoracic VBT, while 4 had thoracolumbar VBT and 3 had bilateral VBT. A median of 7 (5-11) levels were tethered. Preoperative mean height of 155.1 (130-178) was increased to 162.7 (147-189) at the latest follow-up. At the time of the MRI (mean 72.5  $\pm$  14.8 (60–119) months), the median Sanders score was 8 (7-8). Analyses of changes in thoracic disc and facet scores revealed no differences (p>0.05). For the lumbar levels, 23 patients were graded as normal both at preop and postop. 3 patients that already had multilevel facet degeneration did not show any deterioration. However, 2 patients that had single-level disc degeneration had a 1-point increase. Of the remaining 7 patients that were graded normal at preop, 2 experienced disc, 2 experienced facet, and 3 experienced both disc and facet degeneration, all of which were mild and located at the lower adjacent segments.

**Result**: Intermediate discs and facet joints were preserved after growth modulation with VBT surgery at a mean of 72.5 months of follow-up. 6% of the patients experienced deterioration of



previously degenerated discs, while lower adjacent facets had a mild degeneration in 20% of the patients. Studies in larger cohorts with longer follow-ups are warranted to have more indepth analyses of the effects of relative stabilization and altered biomechanical loads.

**Keywords**: Vertebral Body Tethering, Intervertebral disc, Spinal deformity, Disc degeneration, Facet joint degeneration, Growth modulation

## **Ref No: 2692**

#### UNDERREPORTING BIAS OF PROXIMAL JUNCTIONAL KYPHOSIS AND FAILURE IN ADULT SPINE DEFORMITY SURGERY: A MULTICENTER RADIOLOGICAL REVIEW USING MULTIPLE DIAGNOSTIC CRITERIA

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**Aim**: PJK/PJF are often underreported due to variable clinical significance and radiological subtlety. This study reviewed radiologic data from an international prospective, multicenter, longitudinal cohort study of Adult Spinal Deformity to determine PJK/PJF rates based on different diagnostic criteria and compare them with clinicians' reports.

**Material and Method**: The study enrolled patients aged  $\geq$ 60 years undergoing primary fusion surgery of  $\geq$ 5 levels for spinal deformity. PJK/PJF was reported in the adverse events case report form (CRF), denominated as "junctional pathology" or "compression fracture" by 2 years post-op. Radiologic diagnosis was made by the following 3 criteria: (1) Glattes' PJK: (a) Proximal junctional angle (PJA) (pre-op vs. 2y post-op) >10° and (b) PJA at 2y post-op >10°, (2) ASLS-1 PJF: (PJA >20°, (b) UIV and/or UIV+1 fracture with >20% height loss, (c) screw dislodgement, and (d) spondylolisthesis at UIV+1/UIV >3 mm, (3) Consensus-based PJF: review by four experts focusing on bone, construct or junctional failure.

**Findings**: PJK reported in CRF was found in only 9.0%, but the detailed radiologic review of 166 cases identified Glattes' PJK in 51.5%, whereas ASLS-1 PJF was diagnosed in 45.7% and consensus-based PJF was reported in 52.7%, indicating significant underreporting. The kappa values against ASLS-1 PJF were 0.47 (95% CI: 0.34-0.61) for Glattes' PJK, showing moderate agreement, and 0.81 (95% CI: 0.72-0.90) for consensus-based PJF, indicating almost perfect agreement, but the CRF-based report showed minimal agreement with a kappa of 0.19 (95% CI: 0.09-0.29). ASLS-1 PJF reported in CRF had lower EQ-5D (0.6 vs 0.7, p=0.006) and higher ODI (39.6 vs. 28.9, p=0.04) than underreported cases, showing more symptomatic disability. Cases performed in Asia had higher odds of underreporting than in North America (OR: 8.61, 95% CI: 1.01-73.7, p=0.049).

**Result**: PJK was underreported in clinicians' reports compared to the radiologic assessment of PJK/PJF based on geometric definitions. Underreporting tended to occur when the disability was relatively small, and geographic differences were observed.

**Keywords**: PJK (Proximal Junctional Kyphosis), PJF (Proximal Junctional Failure), Radiologic diagnosis, Adult spinal deformity, junctional pathology

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## Ref No: 2765

## THE EFFECT OF L4-L5 AND L5-S1 TRANSFORAMINAL LUMBAR INTERBODY FUSION AND INSTRUMENTATION LEVEL ON SPINOPELVIC PARAMETERS IN SPINAL STENOSIS SURGERY

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**Aim**: The level of the instrumented lower vertebra and the transforaminal lumbar interbody fusion (TLIF) level in patients undergoing surgery for spinal stenosis (SS) may result in different clinical and spinopelvic parameter outcomes. This study aims to evaluate preoperative and postoperative changes in spinopelvic parameters in patients who underwent posterior spinal instrumentation (PSI) and TLIF at the L4-L5 and L5-S1 levels for SS.

**Material and Method**: Patients diagnosed with SS who underwent PSI and TLIF with a minimum follow-up of two years were retrospectively analyzed. Preoperative and postoperative spinopelvic parameters were evaluated. Additionally, operative time, transfusion requirement, hospital stay, complication rates, and revision incidence were assessed.

Findings: The study included 25 patients (7 males, 18 females) with a mean age of 58.6±11.6 years. TLIF was performed at L4-L5 in 18 patients and at L5-S1 in 7 patients. The mean operative time was 104.2±10.6 minutes in the L4-L5 TLIF group and 112.9±21.4 minutes in the L5-S1 TLIF group. The average intraoperative blood loss was 0.4±0.2 liters and 0.5±0.1 liters, respectively. The length of hospital stay was 5.4±3.3 days in the L4-L5 TLIF group and 4.3±0.8 days in the L5-S1 TLIF group. Two patients in the L4-L5 TLIF group developed complications (neurodeficit and pseudoarthrosis), managed with decompression and screw revision, respectively. The statistical comparison of postoperative changes in spinopelvic parameters between patients with an instrumented lower vertebra at S1 who underwent L4-L5 TLIF (Group 1) and L5-S1 TLIF (Group 2) is presented in Table 1. Additionally, spinopelvic parameter changes between patients who underwent L4-L5 TLIF with (Group 1) and without (Group 2) S1 instrumentation are shown in Table 2.

Table 1. Statistical findings comparing the postoperative changes in spinopelvic parameters between patients with an instrumented lower vertebra at S1 who underwent L4-L5 TLIF (Group 1) and L5-S1 TLIF (Group 2)

Postoperative Change	Group 1 (n=6)	Group 2 (n=7)	P-value
Pelvic Tilt	-2,50 ± 13.2	0.71 ± 3.73	0.586
Sacral Slope	2.83 ± 11.39	-0.86 ± 5.49	0.461
Pelvic Incidence	0.33 ± 11.27	-0.14 ± 4.22	0.919
Lumbar Lordosis	1.5 ± 11.4	-6.14 ± 3.02	0.165
Pelvic Incidence -Lumbar Lordosis	-1.17 ± 13.69	6 ± 5.72	0.274

Table 2. Statistical findings comparing the postoperative changes in spinopelvic parameters between patients who underwent L4-L5 TLIF with S1 instrumentation (Group 1) and those without S1 instrumentation (Group 2)

Postoperative Change	Group 1 (n=6)	Group 2 (n=12)	P-value
Pelvic Tilt	-2.5 ± 13.2	3.58 ± 5.73	0.185
Sacral Slope	2.83 ± 11.39	-1.33 ± 7.2	0.385
Pelvic Incidence	0.33 ± 11.27	2.25 ± 6.54	0.651
Lumbar Lordosis	1.5 ± 11.4	-3.33 ± 14.67	0.492
Pelvic Incidence - Lumbar Lordosis	-1.17 ± 13.69	5.58 ± 14.41	0.355

**Result**: In patients with an instrumented lower vertebra at S1, those who underwent L4-L5 TLIF had shorter operative times and less blood loss than those who underwent L5-S1 TLIF. However, no statistically significant differences in postoperative spinopelvic parameter changes were observed between the L4-L5 and L5-S1 TLIF groups. Furthermore, no significant differences were found between L4-L5 TLIF patients with and without S1 instrumentation regarding operative spinopelvic parameter changes. These findings suggest that TLIF and instrumentation levels may impact surgical duration, blood loss, and complication rates in SS surgery, but their effect on spinopelvic parameters is limited. Surgical planning should

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consider these factors on a patient-specific basis. Further studies with larger cohorts are needed to better understand the long-term clinical and radiological effects of instrumentation levels.

Case Example 1



Case Example 2



Keywords: spinal stenosis, spinopelvic, tlif, psi, instrumentation

## Ref No: 2790

## NOMOGRAM ANALYSIS FOR PREDICTING CLINICAL PROGNOSIS IN PATIENTS WITH SUBAXIAL CERVICAL SPONDYLOSIS TREATED WITH A COMBINED SURGICAL METHOD OF LATERAL MASS-TRANSFACET SCREWING

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**Aim**: Different surgical techniques are employed in the surgical treatment of patients diagnosed with subaxial cervical spondylosis, and there is still no consensus on the matter. This situation directs spinal surgeons toward the search for alternative surgical methods. In our study, a combined lateral mass-transfacet screw fixation surgery developed in our clinic is presented as a new option among posterior surgical approaches. The impact of our new surgical method on clinical prognosis was investigated through nomogram analysis, and the results are presented. Upon reviewing the literature, there is no similar study to our existing work.

**Material and Method**: The study included patients diagnosed with subaxial cervical spondylosis who underwent lateral mass screw fixation surgery and combined lateral mass-transfacet screw fixation surgery at Ankara Bilkent City Training and Research Hospital between 2019 and 2025. Patients were followed up for at least 4 months postoperatively. Variables in this study included patients' age, sex, comorbidities, preoperative and postoperative Japanese Orthopaedic Association(JOA) scores, preoperative and postoperative Visual Analog Scale(VAS) scores, two different surgical techniques, preoperative radiological findings (preoperative MRI measurements of cervical canal length), whether C7 dissection was performed, and operation times. To assess the clinical evaluation and prognosis of patients, recovery rates were calculated using preoperative and postoperative JOA scores.

**Findings**: In our study, the statistical analysis results of the variables we identified for patients diagnosed with subaxial cervical spondylosis were examined for their effect on the JOA recovery rate. In these analyses, the surgical technique (combined lateral mass-transfacet screw fixation surgery), the absence of C7 dissection, sex (male), (short) operation duration, (low) postoperative VAS score, and the presence of radiological findings (increased canal stenosis) were found to be statistically significant. The significant variables in univariate analysis were



included in a multivariate logistic regression model. The results from this analysis indicated that only surgical technique and radiological findings were statistically significant independent variables. Alongside these parameters, a nomogram analysis predicting clinical prognosis was drawn, emphasizing the high positive impact of the combined lateral mass-transfacet screw fixation surgery we developed.

**Result**: In summary, decisions should be made considering individual factors such as the patient's medical condition, lifestyle, educational level, and comorbidities, as well as the surgeon's experience, the appropriateness of the surgical technique for the patient, and the facilities available in the clinic where the surgery will be performed.

**Keywords**: JOA Scoring, Lateral Mass, Subaxial Cervical Spondylosis, Nomogram, Combined Lateral Mass-Transfacet Screw Fixation

## Ref No: 2821

## ARTIFICIAL INTELLIGENCE ASSISTED SCOLIOSIS EXAMINATION

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**Aim**: Today, early diagnosis and continuous monitoring of scoliosis is a critical process that can significantly affect the quality of life of patients. In this context, AI-assisted methods have the potential to improve the accuracy and efficiency of scoliosis examination and follow-up processes. The main purpose of this study is to evaluate the applicability and effectiveness of the model we developed with artificial intelligence technologies for scoliosis examination and follow-up.

**Material and Method**: In this study, examination and radiologic images of 10 scoliosis patients followed were used. A study was performed using 2.5 cm diameter markers with a black adhesive base and a white crosshair. These markers were placed on the palpable prominences of the spine on the back and lumbar regions of 15 individuals, five in total. A database was then

created by taking photographs of these individuals from different angles. The markers were processed with augmentation (virtual enhancement) techniques on the obtained photographs, thus creating a dataset. This dataset was trained using the object recognition algorithm YOLOv8 and a model was developed as a result.During the patient examination, one marker each at the C7 and L5 vertebral levels and the other three markers were attached to the vertebral prominences where the deformity was most prominent in the thoracic, thoracolumbar and lumbar regions. After photographing the patients, the angular values of the curvatures of the spine in the coronal plane were measured by computer using the model we developed. The measurements obtained by this method were compared with the Cobb angle measurements we performed on the patients' whole-column vertebral orthorontgenograms.

**Findings**: The mean cobb angle measured by the patients was 20.82 ( $\pm$ 14.51), and the mean angle of the same regions examined on the photographs of the patients with the help of artificial intelligence was 17.11 ( $\pm$ 15.07) and a significant correlation was found with Pearson correlation test (p<0.001).

**Result**: This study demonstrates the usability and effectiveness of artificial intelligence-assisted methods in the diagnosis and follow-up of scoliosis. A close agreement was observed between traditional Cobb angle measurements and those of our Al model. Cobb angle measurements in the thoracic, thoracolumbar and lumbar regions yielded consistent results with both methods. These findings suggest that artificial intelligence technologies can be used as an important tool in scoliosis examination and follow-up. However, it is important to note that these results need to be confirmed on larger patient groups and our Al model needs to be continuously improved and updated.

Keywords: Artificial Intelligence, adolescent idiopathic scoliosis

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## Ref No: 2917

## COMPARATIVE OUTCOMES OF SHORT SEGMENT, SHORT SEGMENT WITH TLIF, AND LONG SEGMENT FIXATION IN LUMBAR SPONDYLOLISTHESIS: A RETROSPECTIVE CLINICAL STUDY OF 123 PATIENTS

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**Aim**: This study aims to compare surgical outcomes in patients with lumbar spondylolisthesis treated using threedifferent techniques: short segment fixation, short segment fixation with transforaminal lumbar interbodyfusion (TLIF), and long segment fixation. The primary endpoints included postoperative pain relief, radiographic alignment, implant survival, and long-term functional outcomes.

**Material and Method**: A total of 123 patients with Grade I-III lumbar spondylolisthesis who underwent surgery between 2022 and2024 were retrospectively analyzed. Patients were categorized into three groups:- Group A: Short segment fixation (n=43)- Group B: Short segment fixation with TLIF (n=38)- Group C: Long segment fixation (n=42)All patients were followed for at least 14 months. Pre- and postoperative assessments included Visual AnalogScale (VAS) scores for pain, radiographic listhesis correction (via lateral X-rays), and the incidence of implant-related complications.

**Findings**: - Pain Control: No statistically significant differences in postoperative VAS scores were observed across thegroups (p > 0.05), indicating comparable effectiveness in pain management.-Radiographic Outcomes: Group C (long segment) achieved better correction of listhesis, especially in casesinvolving the thoracolumbar junction, providing enhanced sagittal alignment.- Functional Outcomes: Group B (short segment + TLIF) exhibited faster recovery and higher functionalscores despite lesser radiologic correction, suggesting that TLIF contributes to mobility preservation andminimizes stiffness.-Implant Survival: In L5-S1 cases, long segment fixation had higher rates of hardware failure, likely due toincreased stress at the lumbosacral junction. Two-level constructs with TLIF demonstrated better implantlongevity.

Table 1. Comparative Analysis of Clinical and RadiographicOutcomes in Lumbar Spondylolisthesis Surgery

Parameter	Group A	Group B	Group C
Postoperative VAS Score	2.3 ± 1.1	2.1 ± 1.0	2.2 ± 1.2
Listhesis Corre- ction (%)	72%	76%	85%
Time to Ambu- lation (days)	5.4	3.1	4.6
Implant Failure Rate	9.3%	5.2%	12.1%
Mean Follow-up (months)	14.6	15.1	14.9

**Result**: Surgical approach selection for spondylolisthesis should be individualized based on spinal level andpatient-specific factors. Long segment fixation is radiographically advantageous in complex or upper lumbarcases. However, short segment fixation with TLIF is more favorable for L5-S1 spondylolisthesis, offeringbetter functional recovery and implant durability. TLIF enhances disc height restoration and load-sharing,potentially reducing mechanical stress on posterior hardware

**Keywords**: Spondylolisthesis, Short segment fixation, TLIF, Long segment instrumentation, Lumbar fusion, VAS score

## Ref No: 2922

#### EVALUATION OF EARLY PULMONARY COMPLICATIONS AFTER VERTEBRAL BODY TETHERING SURGERY AND MANAGEMENT OF THESE COMPLICATIONS

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**Aim**: The purpose of this study is to evaluate the pulmonary complications we encountered after vertebral body tethering (VBT) surgery and to share our experience in the management of these complications with the literature

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Material and Method: We included a total of 217 patients who were treated with vertebral body tethering due to adolescent idiopathic scoliosis between 2015-2024. The demographic structures of the patients and the complications seen in the early postoperative period were recorded. Triflow breathing exercises were started for 1 week before surgery in all patients and continued until the 3rd week after surgery. We used double chest tubes in patients who underwent bilateral VBT. Patients were followed up with daily chest radiographs after surgery. A drainage catheter was applied to 1 patient with resistant pleural effusion. In patients with chylothorax, oral intake was stopped, low-calorie iv nutrition was started and somatostatin treatment was started. Bronchoscopy was performed in 2 patients with atelectasis and mucus plug was seen. The nature of the complications observed and possible predisposing factors were examined.

**Findings**: Of the 217 patients included in the study, 158 (72.8%) were female and 59 (27.2%) were male. The mean age of the patients was 14.7 (12-21). We observed early pulmonary complications in a total of 12 (5.5%) patients. The most common pulmonary complication was pleural effusion in 6 patients. We observed chylorthorax in 2 patients, atelectasis in 3 patients and air leakage in the chest tube in 1 patient. Statistically significant, complications were seen more frequently especially in patients with diaphragm incision and double chest tubes (P<0.001). Pulmonary complications were seen in 2 of the 7 patients who underwent revision surgery for any reason. The pulmonary complications seen in the patients were treated with early intervention and no sequelae were left in any patient.

pleural effusion



images of the patients who deveoped pleural effusion after VBT surgery

atelectasis



urkishspine

images of the patients who had atelectasis after VBT surgery

**Result**: VBT surgery is a surgery in which the thorax is opened and is open to possible pulmonary complications. Especially double-tube and revision surgeries increase the tendency to pulmonary complications. Complications can be treated without leaving sequelae with breathing exercises started before surgery and early intervention

**Keywords**: vertebral body tethering, pulmonary complications, pleural effusion, chylothorax, Triflow exercises

## **Ref No: 3037**

## PROSPECTIVE RANDOMIZED COMPARISON OF STAGED EXPOSURE AND INSTRUMENTATION WITH UNSTAGED EXPOSURE AND INSTRUMENTATION IN TERMS OF HEMODYNAMICS AND BLOOD REQUIREMENTS IN LONG SEGMENT SPINE SURGERY

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**Aim**: This study aims to conduct a prospective, randomized trial comparing the effects of staged and non-staged exposure and instrumentation techniques on hemodynamic parameters and blood requirements in long segment spine surgery.

**Material and Method**: A total of 60 patients who underwent long-segment spine surgery at Dicle University's Orthopedics



and Traumatology Clinic between January 1, 2024, and October 16, 2024, were included. They were randomly assigned to two groups: Method 1 (staged exposure-instrumentation) and Method 2 (non-staged exposure-instrumentation). Hemodynamic parameters and blood transfusion requirements were analyzed in both groups preoperatively, intraoperatively, and postoperatively.

#### Method 1



Staged exposure-instrumentation

Method 2



Non-staged exposure-instrumentation

**Findings**: Among the 30 patients in Method 1, 16 (53%) were male and 14 (47%) were female, with a mean age of 17.23 ( $\pm$ 5.92) years. The mean number of vertebral levels fixed was 12.43 ( $\pm$ 2.97), the mean preoperative hematocrit (Hct) was 41.38 ( $\pm$ 5.52), mean blood volume from drains was 470 ( $\pm$ 156) cc, and mean operative time was 198 ( $\pm$ 54.82) minutes. In Method 2, 3 (10%) were male and 27 (90%) were female, with a mean age of 18.16 ( $\pm$ 5.29) years. The mean number of vertebral levels fixed was 13.73 ( $\pm$ 2.42), mean preoperative Hct was 40.29 ( $\pm$ 3.95), mean blood volume from drains was 944 ( $\pm$ 224) cc, and mean operative time was 281 ( $\pm$ 40.52) minutes. No statistically significant differences were found between the groups in first and second intraoperative Hct values (p=0.325, p=0.08), postoperative control Hct values (p=0.247). However, Method 1

showed statistically significant advantages in postoperative Hct at 22:00 (p=0.019), total blood volume from drains (p=0.000), morning control Hct values on postoperative days 1, 2, 3, and 4 (p=0.006, p=0.007, p=0.000, p=0.001), operative time (p=0.000), and postoperative blood transfusion (p=0.000). Among patients receiving postoperative blood transfusion (Method 1: n=11, Method 2: n=24), significant differences favored Method 1 in blood volume from drains (p=0.000), morning Hct values on postoperative days 3 and 4 (p=0.009, p=0.022), and operative time (p=0.001). In patients without transfusion (Method 1: n=19, Method 2: n=6), significant differences in favor of Method 1 were observed in total blood volume from drains (p=0.000) and operative time (p=0.009).

**Result**: The staged exposure and instrumentation method has been found to be more advantageous in terms of patient safety with shorter operative time, less blood loss and lower blood transfusion requirement in long segment spine surgery.

**Keywords**: Bleeding, Surgical, Vertebrae, Staged, Non-staged, Exposure

## Ref No: 3130

## FREQUENCY OF RECURRENCE AFTER SIMPLE MICRODISCECTOMY IN CENTRAL LUMBAR DISCS AND THE NEED FOR INSTRUMENTED FUSION INTHIS PATIENT GROUP

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**Aim**: Lumbar disc herniation (LDH) refers to the displacement of intervertebral disc material beyond the normal confines of the disc space. It accounts for approximately two-thirds of all spine-related pain complaints. Additionally, it is the most common cause of sciatica, affecting 1–5% of the population annually.The most common surgical treatment for LDH is microdiscectomy. The most frequently observed complication after microdiscectomy is recurrent disc herniation. Various studies have reported the recurrence rate of lumbar disc

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herniation after microdiscectomy to be between 5-15%. Recurrent disc herniation is defined as the reappearance of disc herniation, confirmed both symptomatically and radiologically, after a symptom-free period of at least six months following lumbar discectomy. Several risk factors exist for recurrence, including age, sex, hypertension, diabetes, smoking, and surgical technique. Performing an aggressive discectomy, laminectomy during discectomy, removal of more than 50% of the facet joints in addition to laminectomy, multilevel laminectomy, and central disc herniation all increase the risk of postoperative spinal instability.If risk factors such as a large annular rupture, weak paravertebral musculature, Modic degeneration, and central disc herniation coexist, some studies in the literature suggest that fusion surgery should be added to the initial microdiscectomy procedure. In this study, we aimed to demonstrate that patients with centrally located LDH who do not undergo fusion surgery may have a higher risk of recurrence and a greater likelihood of requiring reoperation.

**Material and Method**: Among 798 adult patients who underwent simple microdiscectomy surgery at our clinic between 2021 and 2024, those who required reoperation due to recurrence were identified. From this group, the reoperation rates of patients with central lumbar disc herniation were analyzed and compared with data from the literature.

**Findings**: Among the 798 patients who underwent single- or two-level simple lumbar microdiscectomy during this period at our clinic, recurrence was observed in 29 patients, all of whom underwent reoperation at our center. Notably, 15 of these 29 patients had central lumbar disc herniation.

**Result**: According to the results of our study, patients with central lumbar disc herniation or those with predominantly central disc herniation have a higher risk of reherniation due to postoperative instability following simple microdiscectomy. In this patient group, adding fusion surgery to the initial microdiscectomy may be considered; however, high-quality studies with stronger levels of evidence are needed to support this approach.

Keywords: Central, lumbar disc herniation, instability

## Ref No: 3230

## OUR LUMBAR SYSTEM REVISION SURGERY EXPERIENCE WITH 1395 CASES IN OUR CLINIC

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**Aim**: Revision spine surgery is a procedure performed to correct or improve the results of a previous spine surgery. This study aimed to evaluate the reasons for the need for revision surgery in patients who had undergone lumbar spine surgery (LOC), and the radiological and clinical results in the postoperative period.

**Material and Method**: Patients who underwent lumbar system revision at the Afyonkarahisar State Hospital Brain and Nerve Surgery Clinic in 2024, who had clinical follow-ups and had appropriate radiological data were included in the study. Preoperative and postoperative computerized tomography and magnetic resonance imaging were used in the radiological evaluation of the patients.

**Findings**: A total of 1395 patients were evaluated, 358 (25.7%) male and 1037 (74.3%) female, with a mean age of  $59.6 \pm 12.03$ (between 15 and 93 years). Only one of the patients was under 18 years of age (15 years old). The patients were divided into 5 groups according to the reason for their operation. In the first group, there were 349 patients with adjacent segment disc disease or spinal stenosis. 319 of these cases were our own clinic patients, while 30 patients were operated on in external centers. When the 488 patients with system fracture (Screw, Rod) in the second group were evaluated: 76 patients had their systems completely removed due to the radiological evaluation and fusion development detected during surgery. In the third group; 189 of the 209 patients with surgical screw malposition after control tomography were our clinic patients, and 20 patients were patients who applied to our clinic from external centers. Of these, 139 of the screws were medial and 70 were lateral. The fourth group included 320 patients with system pseudoarthrosis, especially those with pain due to the screw and system remaining idle after sacral sclerosis in the S1 screw. Depending on the fusion status of the patients, the system was renewed in 296 patients, and the system was removed in 24 patients. The fifth group included 27 patients with infection. Patients underwent system revisions after surgical and medical treatment.

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A 47-year-old female patient with adjacent segment development in the L1-2 range



A 47-year-old female patient with adjacent segment development in the L1-2 range

**Result**: Revision operations in spine surgery are a difficult process for both the physician and the patient, prolonging the hospital stay and increasing the possibility of permanent pain and deficit. In our clinic, 5171 patients were operated on in 2024, 1395 of which were revision surgeries.

**Keywords**: REVISION SURGERY, spine, system fracture, pseudoarthrosis

## Ref No: 3294

## FINITE ELEMENT AND BIOMECHANICAL EVALUATION OF CURRENT IMPLANTS IN THE POSTERIOR TREATMENT OF PELVIC RING INJURIES WITH SACROILIAC INJURIES

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<sup>1</sup>Etlik Şehir Hastanesi

**Aim**: Aim of the artictle is biomechanical and finite element analysis of implant options of pelvic ring fractures with sacroiliac joint injury to determine that which option is more saleable

**Material and Method**: According to Denis classification and Isler classification, 6 different fracture types, 4 different fixation techniques (sacroiliac screw, transiliac screw, plate and polyaxial screw) were compared with 24 models. After providing Young modulus and optimization of Sawbone and 3D printing materials, measurements were made in compressiontension device (Shimadzu). Finite element part of the research was carried out with CT images provided for scientific research within the scope of 'Visible Human Project'.

posterior tension band with poliaxiel screw



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**Findings**: The results are given comparatively according to 4 different fixation types in each fracture type. Stiffness (N/mm) values were calculated and compared. Accordingly, Transiliac fixation method showed the best strength in each fracture type. However, Iliosacral screw method also gave similar results. However, in each fracture type, posterior tension band and posterior plate methods performed with polyaxial screw gave similar results and were observed as the methods with the weakest strength. However, in the posterior tension band method performed with plate, it was seen that the stability of the screw applied to the fracture fragment of the sacrum was quite high. In general, the best method was Transiliac fixation and the weakest method was found to be posterior tension band fixation performed with polyaxial screw.

**Result**: Although the mechanical results of iliosacral screw and transiliac screw are better, much more stable results can be obtained by adding the transiliac screw to the posterior tension band made with the pedicle/rod, providing the advantage of providing sufficient tension to the combination iliac wings.

**Keywords**: Pelvic fracture, Posterior tension band, Iliosacral screw, Transiliac screw, Polyaxial screw, Finite elements, Biomechanics

treatment of lumbar instability. Although posterior stabilization is usually performed, 360-degree fusion can be performed in some cases. In this study, we aimed to present our experiences of lumbar 360-degree stabilization and fusion surgeries performed at different times in three separate cases.

Material and Method: Case 1A 21-year-old male patient was admitted due to L4 burst fracture after a traffic accident. Upon arrival, the patient's neurological examination revealed knee extension and distal muscle strength as 0/5 AO Spine type A2, N4, score: 6. The patient was taken to surgery and 360-degree fusion surgery was performed. L2-S1+ Iliac stabilization was performed during the surgery. The patient developed a perop dural tear complication. The patient's post-op neurological examination revealed knee extension as 4/5 and distal muscle strength as 1/5 in total. No change was observed in muscle strength during the patient's 6th month follow-up examination. Case 2A 35-year-old female patient was admitted due to spinal hydatid cyst. In the patient's neurological examination, muscle strength was dorsiflexion 4/5, and other system examinations were normal. The patient was taken to surgery and 360-degree lumbar fusion surgery was performed. The patient underwent L3-S1 + iliac stabilization during the surgery. A per-op dural tear developed during the surgery. The dura was repaired by suturing. In the patient's post-op neurological examination. ADF was detected as 1/5. In the patient's 6th month follow-up, muscle strength was evaluated as ADF 2/5.

Case 1



Preoperative and postoperative images of the patient are observed.

## **Ref No: 3401**

## OUR LUMBAR 360 DEGREE STABILIZATION AND FUSION SURGERY EXPERIENCES

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**Aim**: Lumbar instability may develop due to lumbar fracture, degeneration-related instability, or metastatic cancer. Stabilization and fusion surgery can be applied in the surgical

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Case 2



Pre-op and post-op images of Case 2 are given in the figure.

**Findings**: Case 3A 77-year-old male patient was admitted with spinal metastasis to the L4 vertebra. The patient's neurological examination was evaluated as ADF 4/5, SINS ;10. The patient underwent L2-S1 + iliac stabilization during the operation. The patient's neurological examination was evaluated as 5/5 after the operation. The patient died due to pulmonary embolism in the 4th month of follow-up.Two of the cases had anterior fusion, while one had anterolateral fusion. One had an increase in postoperative deficit, while the other two had no additional deficit. Two of the patients had peroperative dural tears. No patient developed a cerebrospinal fluid fistula postoperatively. One patient had a pouch at the wound site, which was drained with a syringe.

#### Case 3



Pre- and post-operative images of Case 3 are as shown in the figure.

#### Table 4

Case	Age/ gender	Diagno- sis	level	Appro- ach	Surgical Time	Bleeding
Case1	21/E	Trauma	L4	Anterior	P:240 A:240	A:200 P:1000
Case2	36/K	Hydatid cyst	L5	Antero- lateral	P:180 A:300	A:600 P:200
Case3	77/E	Metasta- sis	L4	Anterior	P:180 A:180	A:400 P:200

Comparative analysis of three different cases is given in the table.

**Result**: 360 degree fusion can be selected in suitable cases in lumbar spinal surgery. It should be kept in mind that the risk of complications is high in these surgeries.

Keywords: 360 degree fusion, anterior approach, instabilite

## **Ref No: 3479**

#### APPLICATION OF BALLOON KYPHOPLASTY IN VERTEBRAL COMPRESSION FRACTURES: A CASE SERIES EVALUATING CLINICAL OUTCOMES AND VAS SCORES

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**Aim**: Vertebral compression fractures have increasingly become a common condition associated with osteoporosis and aging, occurring both with and without trauma. In patients who do not benefit from conservative treatments (non-steroidal antiinflammatory drugs, rest), balloon kyphoplasty is considered an effective surgical option for pain palliation and comfort. Balloon kyphoplasty is a minimally invasive technique commonly used in elderly populations with comorbidities.

**Material and Method**: Between 2022 and 2025, we retrospectively reviewed 183 patients who underwent balloon kyphoplasty. The patients were classified based on parameters such as age, comorbidities, smoking history, VAS score, and trauma history.

**Findings**: Patients mean age of 62.4  $\pm$  15.8, and the median (min-max) age was 65 (21-93). Of these patients, 84 (45%) were male and 99 (55%) were female. In 2 (1%) patients, an increase in postoperative VAS was observed, and in 14 (7%) patients, there was no change in VAS between preoperative and postoperative periods (table 1).Postoperative VAS scores were significantly lower compared to preoperative scores (p < 0.001). This indicates that the procedure significantly reduced



the pain levels of the patients in a statistically meaningful way. The statistical analysis revealed a significant difference in preoperative VAS scores between patients with trauma and those without trauma (p < 0.001, Mann-Whitney U test). This suggests that pain due to trauma was perceived more severely by preoperative patients. There was a statistically significant difference in postoperative VAS scores between patients with trauma and those without trauma (p < 0.05), indicating that patients with trauma reported higher postoperative pain (i.e., more pain). However, there was no statistically significant difference between the preoperative and postoperative VAS score changes and trauma history (p > 0.05). When gender was analyzed, although the postoperative VAS scores were higher in males, no statistically significant difference was found (p > 0.05) (table 2).

**Result:** Balloon kyphoplasty appears to be an effective minimally invasive surgical option for vertebral compression fractures, particularly for pain palliation in osteoporotic fractures (figure 1). Significant improvements in VAS scores were observed in patients with osteoporosis, metastases, and fractures related to Cushing's disease, even without a trauma history. It has proven to be an effective treatment option for both acute and chronic trauma-related fractures. However, long-term outcomes, complications, and the potential development of instability remain open to further evaluation in terms of treatment safety.





T12 COMP.FX. PREOP POSTOP

Keywords: Balloon Kyphoplasty, Osteoporosis, Trauma, VAS



TABLE 2



TABLE 1



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## **Ref No: 3484**

## PULMONARY CEMENT EMBOLISM FOLLOWING POLYMETHYLMETHACRYLATE (PMMA) INJECTION

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**Aim**: Vertebroplasty and kyphoplasty are minimally invasive techniques frequently employed for the treatment of osteoporotic vertebral fractures and metastatic spinal lesions. With advancements in surgical instrumentation, polymethylmethacrylate (PMMA) can also be administered through cannulated pedicle screws. However, a rare but potentially serious complication of these procedures is pulmonary cement embolism (PCE), which occurs when PMMA enters the venous system and reaches the pulmonary circulation. The aim of this study is to evaluate the incidence, clinical presentation, diagnostic methods, and management strategies of PCE in patients who underwent PMMA injection for vertebral procedures.

**Material and Method**: A retrospective review was conducted on 200 patients treated with PMMA vertebral injections at Ümraniye Training and Research Hospital between 2018 and 2024. The study included cases where PMMA was used in vertebroplasty, kyphoplasty, or via cannulated pedicle screws. Patient demographics, procedural data, post-procedure symptoms, imaging findings, and clinical outcomes were assessed. PCE cases were identified based on chest imaging performed after symptom onset.

**Findings**: A total of 232 vertebral levels were treated across 200 patients: 156 patients underwent vertebroplasty, 40 kyphoplasty, and 4 PMMA injections via cannulated screws. Cement leakage was identified at 77 levels. Pulmonary cement embolism was detected in 4 patients (2%), all of whom were asymptomatic at the time of diagnosis. These cases were discovered through chest X-rays and CT scans performed due to mild symptoms such as cough, fever, or wheezing. No patients required specific

treatment for PCE beyond standard pneumonia therapy, and all recovered without long-term complications. No mortality was observed among the study population.

**Result**: Pulmonary cement embolism is an infrequent but clinically significant complication following PMMA injection procedures. While most cases remain asymptomatic, early recognition is essential, particularly in symptomatic patients. Our findings are consistent with the incidence rates reported in the literature. Preventive measures such as careful injection techniques and monitoring for cement leakage may reduce the risk of embolism. Further studies are warranted to better identify risk factors and optimize patient safety.

**Keywords**: Polymethylmethacrylate (PMMA), Pulmonary Cement Embolism, Vertebroplasty, Kyphoplasty, Complications, Cement Leakage, Minimally Invasive Spine Surgery

## Ref No: 3618

#### EFFECT OF SELECTIVE AND NONSELECTIVE FUSION ON CERVICAL SAGITTAL ALIGNMENT IN LENKE 5 SCOLIOSIS

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**Aim**: To compare the change in cervical sagittal alignment(CSA) after surgery in Lenke 5 patients who underwent selective and non-selective fusion and to evaluate the effect of this situation on functional results.

**Material and Method**: 50 Lenke 5 AIS patients who underwent posterior pedicle screw fusion between January 2015 and March 2021 were retrospectively reviewed. The patients were divided

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into two groups: selective and non-selective fusion groups. Preoperative and postoperative radiological measurements of the patients were made using the SURGIMAP(Nemaric Inc., USA) (https://www.surgimap.com/) measurement system. Clinical outcomes were evaluated with the Scoliosis Research Society-22(SRS-22) and Neck Disability Index(NDI) questionnaires.

**Findings**: While cervical lordosis increases significantly in the selective group, it does not change in the non-selective group. While TK decreased significantly in the non-selective fusion group, it did not change in the selective group. C2 Slope measurements show a significant decrease in the selective group in the postoperative period, and T1 slope shows a significant increase in the postoperative nonselective group(p<0.05). A positive, statistically significant relationship was found between the rate of change in CL measurements and the rate of change in cSVA measurements in the selective group(r:0.594; p=0.004). There is no significant difference between the SRS-22 and NDI scores of the preoperative and postoperative groups(p>0.05).

Figure 1



Preoperative whole spine anterior-posterior, lateral radiograph (A) and cervical lateral radiograph (B) of a 17-year-old female patient. Postoperative 7th year anterior-posterior, lateral radiograph (C) and cervical lateral radiograph (D) of the patient who underwent selective fusion.

Figure 2



Preoperative whole spine anterior-posterior, lateral radiograph (A) and cervical lateral radiograph (B) of a 16-year-old female patient. Postoperative 7th year anterior-posterior, lateral radiograph (C) and cervical lateral radiograph (D) of the patient who underwent non-selective fusion.

Table 1: Evaluation of Descriptive Characteristics by Groups	Table	1:	Evaluation	of	Descriptive	<b>Characteristics</b>	by	Groups
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		Total	Group 1 (n=26)	Group 2 (n=24)	p	
Age (vil)	Min-Max(- Median)	11-19 (15)	11-19 (16,5)	12-19 (15)	ª0,328	
- ( )	Mean±Sd	15,56±2,13	15,85±2,24	15,25±2,01		
Candar	Female	43 (86,0)	22 (84,6)	21 (87,5)	b1 000	
Gender	Male	7 (14,0)	4 (15,4)	3 (12,5)	*1,000	
Fol- low-up	Min-Max(- Median)	2-7 (5)	2-7 (4,5)	2-7 (5)	°0,715	
time (yıl)	Mean±Sd	4,70±1,75	4,62±1,77	4,79±1,77	-,	
Number of fixed	Min-Max(- Median)	4-14 (7)	4-7 (6)	11-14 (13)	°0,001**	
vertebrae	Mean±Sd	9,02±3,66	5,65±0,94	12,67±0,92	- ,	
Coronal Balance						
Preop	Min-Max(- Median)	2-49 (18,5)	2-49 (18,5)	3-45 (18)	°0,515	
	Mean±Sd	19,88±11,60	20,81±11,96	18,88±11,35	0,010	

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Postop	Min-Max(- Median)	1-20 (11)	1-20 (12,5)	2-20 (9)	°0,330	
	Mean±Sd	11,12±5,69	11,77±5,86	10,42±5,53		
Cobb Minor						
Preop	Min-Max(- Median)	0-55 (19)	5-44 (18)	0-55 (24)	⁰0,627	
	Mean±Sd	21,64±13,33	20,15±10,20	23,25±16,14		
Postop	Min-Max(- Median)	0-41 (8)	0-38 (8)	0-41 (8,5)	°0,690	
	Mean±Sd	11,42±10,06	12,12±11,54	10,67±8,34		
Cobb TL/L						
Preop	Min-Max(- Median)	42-65 (49)	42-65 (47)	45-60 (51)	°0,134	
	Mean±Sd	49,06±6,78	47,81±6,43	50,42±7,02		
Postop	Min-Max(- Median)	3-39 (13,5)	3-39 (9)	3-31 (14,5)	°0,593	
	Mean±Sd	13,74±8,84	13,12±9,70	14,42±7,95		

Table 2: Evaluation of Radiological Sagittal Parameters Accor	ding
to Groups	

		Group 1 (n=26)	Group 2 (n=24)	
Mean±Sd (Median)		Mean±Sd (Me- dian)		p
	Preop	47,27±10,88 (46)	49,38±11,30 (50,5)	ª0,505
Pelvic	Postop	46,50±11,40 (45,5)	47,33±12,53 (49,5)	ª0,807
Incidence	ďp	0,605	0,169	
	Change (%)	-0,46±15,98 (2,2)	-4,04±14,14 (0)	°0,336
	Preop	9,54±8,79 (10)	10,46±6,49 (12)	ª0,678
	Postop	12,54±11,85 (12,5)	11,71±7,98 (11,5)	ª0,774
Feivic Lilt	dp	0,077	0,320	
	Change (%)	68,40±164,97 (30,4)	31,69±89,97 (12,1)	°0,352

	Preop	37,62±6,63 (37)	38,63±8,31 (39)	°0,636	
Sacral	Postop	34,12±8,02 (35)	35,50±8,38 (35,5)	°0,553	
Slope	ďp	0,063	0,058		
	Change (%)	-7,53±24,94 (-5,8)	-6,82±19,17 (-6,5)	°0,907	
5	Preop	-12,42±14,68 (-14,5)	-10,21±9,43 (-8,5)	°0,526	
Pelvic In- cidence -	Postop	-8,73±19,57 (-10)	-8,58±12,36 (-10)	°0,975	
Lumbar Lordosis	ďp	0,179	0,422		
Loruosis	Change (%)	-12,41±190,76 (10,2)	23,13±185,63 (30,1)	°0,627	
	Preop	-59,54±8,87 (-61)	-59,13±8,97 (-60)	°0,871	
Lumbar	Postop	-55,15±13,52 (-54)	-55,83±9,63 (-56)	°0,840	
LUIUUSIS	ďp	0,074	0,131		
	Change (%)	6,93±21,74 (7,2)	4,34±18,82 (10)	°0,793	
	Preop	14,62±13,39 (13,5)	11,38±14,53 (11)	°0,416	
Thoraco- lumbar	Postop	7,27±11,76 (8)	-0,17±7,59 (-1,5)	ª0,010*	
Kyphosis	ďp	0,001**	0,001**		
	Change (%)	-47,46±107,15 (-39,3)	-98,08±159,07 (-75)	°0,094	
	Preop	30,54±12,45 (30)	28,08±10,59 (27,5)	°0,458	
Thoracal	Postop	30,38±11,37 (33)	22,63±5,33 (21)	°0,003**	
Kypnosis	ďp	0,945	0,012*		
	Change (%)	15,85±58,11 (-1,7)	-10,68±30,71 (-14,6)	°0,148	
	Preop	-31,62±43,54 (-30)	-31,75±37,33 (-28)	°0,991	
Sagittal Vertical	Postop	-17,62±44,13 (-31,5)	-32,92±28,65 (-32,5)	°0,150	
Axis	ďp	0,059	0,876		
	Change (%)	8,13±183,23 (21,7)	-63,73±174,42 (14,4)	°0,322	

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	Preop	-1,31±15,88 (-0,5)	-1,29±15,28 (-1,5)	ª <b>0,99</b> 7
Cervical	Postop	-6,38±10,40 (-6)	-1,17±12,89 (-3)	°0,124
Lordosis	ďp	0,036*	0,922	
	Change (%)	-192,94±369,4 (-75,7)	-34,50±270,03 (-50)	ª <b>0,14</b> 6
	Preop	19,00±11,82 (20,5)	18,00±10,31 (20)	°0,752
C2 Slope	Postop	9,81±8,06 (7)	17,88±8,74 (19,5)	°0,001**
	ďp	0,001**	0,949	
	Change (%)	15,62±293,70 (-62,5)	12,05±58,02 (10)	°0,003**
	Preop	20,81±9,78 (20,5)	19,96±7,47 (21)	ª0,733
T1 Slope	Postop	23,12±11,11 (22)	25,88±11,96 (28,5)	°0,408
	ďp	0,174	0,002**	
	Change (%)	22,40±44,83 (8,7)	26,75±53,74 (22,4)	°0,348
	Preop	26,85±10,22 (25,5)	24,38±9,61 (24,5)	°0,384
cSVA	Postop	21,38±7,61 (21)	25,00±11,56 (25,5)	°0,194
	dp	0,005**	0,794	
	Change (%)	-14,22±35,18 (-24)	6,50±57,62 (-7,2)	⁰0,197

Table 3: Examination of the Relationship Between the Rate of Change in Cervical Lordosis Measurements and Other Radiological Measurements

		Cervical Lordosis Change (%)				
	Grup 1 (n=26)		Grup 2			
	r	р	r	р		
Pelvic Inci- dence	Preop	-0,012	0,953	-0,141	0,520	
	Postop	-0,207	0,322	-0,093	0,673	
	Change (%)	-0,117	0,578	0,022	0,921	
Pelvic Tilt	Preop	-0,142	0,497	-0,036	0,871	
	Postop	-0,090	0,668	0,132	0,548	
	Change (%)	-0,028	0,893	0,002	0,993	

	Preop	0,136	0,515	-0,128	0,562
Sacral Slope	Postop	0,108	0,609	-0,180	0,410
	Change (%)	-0,213	0,306	-0,058	0,793
Pelvic Inci-	Preop	-0,187	0,372	0,193	0,377
dence -	Postop	-0,116	0,582	0,098	0,656
Lumbar Lordosis	Change (%)	0,056	0,792	0,234	0,283
	Preop	-0,245	0,238	0,258	0,235
Lumbar Lordosis	Postop	0,004	0,984	0,156	0,477
	Change (%)	0,158	0,451	-0,012	0,955
	Preop	0,147	0,483	0,194	0,374
Thoracolum- bar Kyphosis	Postop	0,054	0,799	0,267	0,218
	Change (%)	0,145	0,499	0,046	0,840
	Preop	0,269	0,194	0,038	0,863
Thoracal Kyphosis	Postop	0,007	0,974	-0,042	0,850
	Change (%)	-0,224	0,282	-0,041	0,854
	Preop	-0,195	0,349	0,166	0,450
Sagittal Verti- cal Axis	Postop	-0,162	0,438	-0,058	0,791
	Change (%)	-0,103	0,624	-0,162	0,460
	Preop	-0,151	0,472	-0,478	0,021*
C2 Slope	Postop	0,175	0,403	0,218	0,318
	Change (%)	0,389	0,060	0,594	0,004**
	Preop	0,232	0,264	-0,133	0,547
T1 Slope	Postop	0,002	0,994	-0,135	0,540
	Change (%)	-0,317	0,140	-0,124	0,574
	Preop	-0,071	0,735	0,025	0,911
cSVA	Postop	0,357	0,079	-0,018	0,937
	Change (%)	0,451	0,024*	-0,098	0,657

**Result**: While postoperative C2-7 lordosis increased significantly in patients who underwent selective fusion, the straight of CSA did not change in the non-selective group. Since this may be a risk factor for cervical pathologies in older ages in the nonselective group, care should be taken not to reduce TK in patients with non-selective fusion.

**Keywords**: C2-7 lordosis, Adolescent idiopathic scoliosis, Cervical sagittal aligment, Lenke type 5, Selective fusion

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## Ref No: 3620

## THE EFFECTS OF TOTAL HIP ARTHROPLASTY (THA) ON PELVIC PARAMETERS AND LUMBAR LORDOSIS IN HIP OSTEOARTHRITIS SECONDARY TO DEVELOPMENTAL DYSPLASIA OF THE HIP (DDH)

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**Aim**: This study is to investigate the effects of total hip arthroplasty(THA) on the sagittal alignment of the lumbosacral spine and pelvis in patients who underwent unilateral THA due to hip osteoarthritis secondary to developmental dysplasia of the hip(DDH) during mid- to long-term follow-up.

Material and Method: Among 187 patients who underwent unilateral THA for DDH between 2015 and 2022, 47 patients who met the inclusion criteria were enrolled in the study.Patients were grouped according to Crowe classification: 27 patients with Crowe Type 1–2 were included in Group A, and 20 patients with Crowe Type 3–4 were included in Group B. of the patients included, 39 were female and 8 were male, with a mean age of 47 years(range: 18–70 years). The mean follow-up duration was 3.4 years. Measurements were performed on lumbosacral lateral radiographs or standing scoliosis lateral radiographs obtained preoperatively and at follow-up.Lumbar lordosis, sacral slope, pelvic tilt, pelvic obliquity, pelvic incidence were measured, pre- and postoperative scores for low back VAS, hip VAS, Back Pain Index, Oswestry Disability Index, Harris Hip Score were compared.Statistical analyses were performed using IBM SPSS 24.0. The sample size was determined based on a power analysis.

Example of pelvic incidence, pelvic tilt, sacral slope measurement



Example of pelvic incidence, pelvic tilt, sacral slope, lumbar lordosis measurement



**Findings**: In Group B, a significant postoperative decrease in pelvic tilt was observed (from  $25^{\circ}$  to  $13^{\circ}$ , p=0.04). Apart from this, no significant differences were found in pre- and postoperative lumbar lordosis, sacral slope, pelvic tilt, pelvic obliquity, and



pelvic incidence in the overall cohort or within Groups A and B separately (p>0.05).In all groups, low back and hip VAS scores significantly decreased, Back Pain Index, Oswestry Disability Index, Harris Hip Score significantly improved without significant differences between groups(p=0.0001).Positive correlations were found between lumbar lordosis, sacral slope, pelvic incidence, pelvic tilt, and pelvic obliquity preoperatively and postoperatively in all groups, while negative correlations were observed between these spinopelvic parameters and low back and hip VAS scores (p<0.05).

Statistical evidence for improvement in pelvic tilt after THA for Crowe 3-4  $\mbox{\rm DDH}$ 

**Result**: The findings suggest that increased pelvic anteversion, one of the compensatory mechanisms induced by DDH, improves in Crowe Type 3–4 hips following THA during midto long-term follow-up.However, no significant changes were observed in Crowe Type 1–2 hips.The improvement in pelvic tilt appears to be correlated with the severity of DDH.Although this correction didn't lead to a significant radiological improvement in lumbar lordosis, clinically significant improvements in pain and functional scores were observed in both groups.Moreover, this study demonstrates that pelvic incidence remains a stable spinopelvic parameter following THA performed for hip osteoarthritis secondary to DDH.

**Keywords**: Developmental Dysplasia of the Hip, Total Hip Arthroplasty, Pelvic Parameters, Lumbar Lordosis, Sagittal Balance, Radiological Evaluation, Crowe Classification, Mid- to Long-Term Follow-up

	DEGERLERIN KARŞILAŞTIRILMASI										
		CRO	WE TYPE	= 1-2			CRO	WE TYPE	= 3-4		Gruplar
	Min	Maks	х	<del>58</del>	м	Min	Maks	х	<del>\$\$</del>	м	arası karşılaştırma p değeri
LOMBER LORDOZ PREOP	5,30	88,30	62,16	18,08	65,30	43,70	89,30	69,06	13,08	73,80	0,195
LOMBER LORDOZ POSTOP	5,50	88,00	61,18	21,44	64,90	45,20	86,70	67,01	11,94	67,50	0,328
Gruplar içi karşılaştırma p değeri			0,654					0,390			_
PELVİK TİLT PREOP	0,90	30,40	12,23	8,41	12,90	0,00	83,90	25,33	25,55	18,30	0,064
PELVIK TILT POSTOP	0,40	26,70	13,10	7,74	13,00	0,80	41,10	13,00	10,86	11,50	0,974
Gruplar içi karşılaştırma p değeri			0,537					0,040			_
SAKRAL SLOPE PREOP	15,10	65,30	45,00	11,59	45,90	31,70	66,20	47,39	8,82	49,60	0,486
SAKRAL SLOPE POSTOP	13,20	79,10	44,03	13,92	44,90	25,70	74,00	50,89	11,40	53,50	0,107
Gruplar içi karşılaştırma p değeri			0,544					0,128			_
PELVIK INSIDANS PREOP	15,60	75,10	54,45	14,61	59,10	16,30	99,20	51,24	22,92	49,45	0,586
PELVIK INSIDANS POSTOP	17,50	103,60	56,12	16,46	58,60	28,60	73,60	49,81	14,94	49,45	0,223
Gruplar içi karşılaştırma p değeri			0,549					0,777			_
BACAK UZUNLUK FARKI PREOP (mm)	0,70	67,70	20,26	17,55	16,00	0,30	173,00	22,20	40,82	11,50	0,835
BACAK UZUNLUK FARKI POSTOP (mm)	0,80	46,80	13,60	11,77	12,50	1,50	81,80	26,06	21,78	18,95	0,048
Gruplar içi karşılaştırma p değeri			0,141					0,761			
PELVİK OBLİSİTE PREOP	0,00	11,40	3,16	2,69	2,50	0,00	9,80	3,80	2,86	3,45	0,442
PELVİK OBLİSİTE POSTOP	0,10	8,40	2,58	1,90	2,40	1,10	8,00	3,73	2,21	4,00	0,063
Gruplar içi karşılaştırma p değeri			0,062					0,885			
HIP PREOP VAS	0,00	10,00	8,27	3,20	10,00	0,10	10,00	8,12	3,59	10,00	0,876
HIP POSTOP VAS	0,00	5,00	1,28	1,57	0,10	0,00	10,00	1,63	2,61	0,55	0,574
Gruplar içi karşılaştırma p değeri			0,000					0,000			
KNEE PREOP VAS	0,00	10,00	4,63	3,73	5,10	0,00	10,00	4,34	4,18	5,00	0,801
KNEE POSTOP VAS	0,00	5,00	1,11	1,71	0,10	0,00	10,00	0,86	2,35	0,10	0,673
Gruplar içi karşılaştırma p değeri			0,000					0,001			

#### CROWE TYPE 1-2 OLAN HASTALAR VE CROWE TYPE 3-4 HASTALARDA İŞLEM ÖNCESİ VE İŞLEM SONRASI DEĞERLERİN KARŞILAŞTIRILMASI

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## **Ref No: 3648**

## COMPARISON OF CLINICAL AND RADIOLOGICAL RESULTS OF POLYETHERETHERKETONE CAGE AND CAGE-SHAPED ALLOGRAFT USE IN LUMBAR INTERBODY FUSION SURGERY

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**Aim**: This study compared the clinical and radiological results of polyetheretherketone(PEEK) cage and cage-shaped allograft use in lumbar interbody fusion surgery.

**Material and Method**: In the study, the results of 30 patients who underwent lumbar interbody fusion surgery and used a PEEK cage for fusion were compared with those of patients who used a cage-shaped allograft. The Visual Analog Scale (VAS) and Oswestry Disability Index (ODI) were used in the clinical evaluation of the patients. The 'Brantigan classification' was used in the computerized tomography scans taken in the first postoperative year to evaluate the interbody fusion radiologically.

Demographic data of the patients

	GROUPE 1 (CAGE-SHA- PED ALLOG- RAFT)	GROUPE 2 (PEEK- CAGE)	P-va- lue
AGE AVERAGE (MIN- MAX)	59,5 (36-77)	52,5 (39- 72)	0,450
GENDER F/M	21/9	23/7	0,559
BMI AVERAGE (MIN- MAX)	27,7 (23-32)	28,1 (21- 30)	0,286
SMOKING YES/NO	8/22	10/20	0,324
COMORBIDITY (DM, HT) YES/NO	16/14	18/12	0,386
OPERATION LEVEL L4-5/L5- S1/L4-S1	12-3-15	16-4-10	0,424
ALLOGRAPHY-CAGE NUMBER L4-5/L5-S1	22-14	24-12	0,347

**Findings**: While the preoperative VAS scores of patients in whom cage-shaped allografts were used were 9.1, it was observed that they decreased to 2.87 at the 1st year controls. Again, it was observed that the preoperative ODI score, which was 48.87 in the allograft group, reduced to 18.53 in the 1st year. In the PEEK cage group, the preoperative VAS score decreased from 8.8 to 3.97, and the ODI score decreased from 42.13 to 24.87. The change in VAS and ODI scores was better in the allograft group (p=0.002, p=0.012). According to the Brantigan classification, no statistically significant difference was observed in the intervertebral fusion evaluation between the groups (p=0.301).

Preoperative and postoperative 1st year VAS and ODI mean values

	ALLOGRAFT	PEEK CAGE	P-value
PREOP VAS	9,1	8,8	0.002
1 <sup>st</sup> YearVAS	2,87	3,97	0,002
PREOP ODİ	48,87	42,13	0.010
1 <sup>st</sup> Year ODİ	18,53	24,87	0,012

Distribution of intervertebral fusion among groups

Fusion	ALLOGRAFT	PEEK CAGE
Grade 1	0	0
Grade 2	1 (3,3%)	5 (16,7%)
Grade 3	5 (16,7%)	4 (13,3%)
Grade 4	21 (70%)	18 (60%)
Grade 5	3 (10%)	3 (10%)

**Result**: In lumbar interbody fusion surgery, using PEEK cages and cage-shaped allografts provides similar radiological results in fusion. However, allografts provided better clinical results in the first postoperative year.

Keywords: Allografts, polyetheretherketone, visual analog scale

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## **Ref No: 3742**

## EVALUATION OF THE EFFECTS OF ANESTHETICS AND SURGERY ON SLEEP QUALITY IN PATIENTS UNDERGOING POSTERIOR SPINAL INSTRUMENTATION SURGERY: A PROSPECTIVE RANDOMISED CLINICAL TRIAL

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**Aim**: We aimed to evaluate the impact of the anesthesia method and surgical procedure on the sleep patterns and sleep quality of patients undergoing posterior spinal instrumentation using the Pittsburgh Insomnia Rating Scale-20 (PIRS-20).

**Material and Method**: A total of 40 patients ASA (American Society of Anesthesiology) I–III aged 18 and over who underwent elective spinal posterior instrumentation was included. The patients were divided into two groups randomly – those with sevoflurane and remifentanil anesthesia and those with total intravenous anesthesia (TIVA) – using the closed envelope method. Patients were evaluated before and after the surgery with the PIRS-20 (surgery one month previously and postoperative 7th day) for sleep quality, VAS (Visual Analogue Scale; recorded preoperative night and postoperative first hour), pain, and State-Trait Anxiety Inventory (STAI) for anxiety (recorded preoperative night and postoperative 7th day) scores.

Demographic and physiological characteristics data

	Group S (n:17)	Group T(n:21)	Р
Age (year)	60.76 ± 10.10	55.471 ± 9.3	0.581
Sex (F/M)	11/6	16/5	0.561
BMI (kg/cm)	29.14 ± 5.48	27.74 ± 4.84	0.504
ASA (I/II/III)	2/12/3	5/14/2	0.383
Sleep Disorder (Y/N)	6/11	5/16	0.728
Neck (N/T)	5/12	13/8	0.089
Mallampati (I/II/III/IV)	1/9/6/1	6/13/1/1	0.029*
Snoring (Y/N)	11/6	7/14	0.101
Sleep Apne (Y/N)	1/16	1/20	0.954
Large Tongue(Y/N)	5/12	5/16	0.772
Surgery (Primer/Revision)	14/3	19/2	0.685
Surgery Level	16/1/0	10/1/10	0.1
Dekomprestion (Y/N)	15/2	16/5	0.542

F:Female, M:Male, Y:Yes, N:No, N:Normally, T:Thickness \*p < 0.05 is significantly different

**Findings**: When pre-operative and postoperative PIRS-20, VAS, and STAI scores were compared, no significant difference was observed between Group T and Group S (p > 0.05). The VAS values in Group S and Group T decreased significantly over time (p < 0.001, p = 0.001, respectively). The STAI scores decreased significantly over time (p = 0.001, p = 0.001, respectively). The PIRS-20 values remained unchanged in Groups S and T (p = 0.132, p = 0.828, respectively).

VAS (Visual Analogue Scale) scores

	Group S (n:17)	Group T (n:21)	P <sup>1</sup>
PreopVAS	5.88 ±1.65	5.61 ± 2.51	0.136
PostopVAS	1.47 ± 1.28	2.28 ± 1.55	0.101
P <sup>2</sup>	<0.001*	0.001*	

\*P2 < 0.05 is significantly different



PIRS-20 scores

	Group S (n:17)	Group T (n:21)	P <sup>1</sup>
PIRS-20 1	17.52 ±12.4	19.38 ± 12.898	0.681
PIRS-20 2	15.11 ± 10.54	18.57 ± 13.02	0.471
P <sup>2</sup>	0.132	0.828	

**Result**: The results of the study showed that, while the type of anesthesia did not affect the quality of sleep in the group of patients receiving posterior instrumentation, the surgical procedure did affect pain reduction in both anesthesia methods.

**Keywords**: posterior instrumentation, sleep quality, anesthetics, spine surgery

## Ref No: 3771

#### DO THE LOCALIZATIONS OF NEURAL STRUCTURES IN THE SPINAL CANAL CHANGE AFTER SURGERY IN ADOLESCENT IDIOPATHIC SCOLIOSIS?

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**Aim**: This study aims to identify potential positional changes in intracanal neural structures following posterior corrective surgery in patients with adolescent idiopathic scoliosis (AIS) and to evaluate the associated risk of neural injury during corrective procedures. Material and Method: This study included 56 patients diagnosed with adolescent idiopathic scoliosis (AIS) who underwent surgery between 2008 and 2022. Patients were selected based on the availability of preoperative and postoperative radiographs and magnetic resonance imaging (MRI) scans with sufficient image quality for measurement. The preoperative and postoperative MRI scans were analyzed to determine the position of the conus medullaris tip. The distance between the line passing through the lower tip of the conus and the inferior endplate of L2 was measured in millimeters. In sagittal sections, the neural foraminal areas on the concave and convex sides were assessed using multiplanar reconstruction (MPR). Additionally, in axial sections, the morphology of the dura and the position of the spinal cord within the canal were recorded. Preoperative and postoperative measurements were compared using the Wilcoxon test.

**Findings**: Among the patients, 64.3% had thoracic and 35.7% had lumbar curvature, with a mean age of 13.8 years. The mean postoperative follow-up period was 20.6 months. No significant difference was observed in the sagittal plane when comparing the preoperative and postoperative levels of the conus medullaris tip (p > 0.05). However, in the coronal plane, a significant postoperative displacement of the conus medullaris tip was detected (p < 0.001). The axial positioning of the spinal cord and the morphological characteristics of the dura within the spinal canal remained unchanged in the postoperative period (p > 0.05). Additionally, the neural foraminal areas showed a significant postoperative increase at both proximal and distal levels of the curvature (p < 0.05).

**Result**: The conus medullaris can shift within the spinal canal following scoliosis surgery. In addition to altering the level of the conus medullaris, corrective forces applied to the spine may also induce changes in the foraminal areas at the upper and lower boundaries of the instrumentation. Due to lumbar deformity, sagittal section measurements demonstrated a high error rate in determining the level of the conus medullaris tip. Coronal MRI sections provided a more precise localization of the distal conus tip.

**Keywords**: Adolescent Idiopathic Scoliosis (AIS), MRI, Posterior Spinal Correction, Neural Structures, Anatomical Changes

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## **Ref No: 3783**

#### SHILLA AND HYBRID TECHNIQUES: A COMPARISON OF TWO METHODS WORKING FOR APICAL CONTROL IN PATIENTS WITH EARLY-ONSET SCOLIOS

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<sup>1</sup>Çam ve Sakura Şehir Hastanesi

**Aim**: The purpose of this study is to identify the best surgical approach for treating patients with EOS, identify a methodology that improves outcomes, especially with regard to apical vertebral translation (AVT), major Cobb angle (MCA), T1-T12 spine length (T1-T12L) and T1-S1 spinal length (T1-S1L) in postoperative follow-ups.

**Material and Method**: 27 patients who had surgery using the Shilla technique (11 patients) and the hybrid procedure (16 patients) were included. Patients with a Cobb angle more than 50°, a bone age of less than 10 words, a minimum follow-up of three months, and no prior surgical history were retrospectively assessed in our study. The average follow-up period in the Shilla group was 30.3 months, and the average age was 7.8 years. The average follow-up period for the Hybrid group was 14 months, and the average age was 7.9 years. AVT, MCA, T1-T12L, T1-S1L, kyphosis, and lordosis measures were assessed in the patients before to and following surgery.

**Findings**: In the postoperative period for the Shilla technique. compared to the preoperative period; the postoperative MCA decreased from an average of 64.7° to 18.9°. For the Hybrid technique, the postoperative MCA decreased from an average of 78° to 45° (p=0.035). Although the Shilla technique provided greater improvement in postoperative MCA values, when considering the changes at the final follow-ups, we observed that there was no statistically significant difference between the two groups in MCA values (p=0.387). For the Shilla technique, the final MCA value increased from 18.9° to 27.8°, while in the Hybrid technique, it increased from 45° to 46.6° (p=0.023). This difference is statistically significant, indicating that the Hybrid technique has a more stable effect on MCA. At the final followups, there was also no statistically significant difference in AVT changes compared to the preoperative period for both groups (p=0.457).

Table 1: Statistical comparison of preoperative and postoperative period radiographic measurement changes between shilla and hybrid techniques

grup		Mean	р
<mark>∆</mark> postop mca – preop mca	shilla technical	-45,82 ± 11.531	<0.05
	hybrit technical	-33 ± 16.505	
Δfinal mca – postop mca	shilla technical	8,91 ± 8.093	<0.05
	hybrit technical	1,63 ± 7.42	
Δfinal mca - preop mca	shilla technical	-36,91 ± 13.27	>0.05
	hybrit technical	-31,38 ± 17.659	
Δpostop T1/T12– preop T1/T12	shilla technical	2,45 ± 1.214	>0.05
	hybrit technical	3,06 ± 1.289	
∆final T1/T12 – postop T1/T12	shilla technical	0,45 ± 1.214	>0.05
	hybrit technical	0,31 ± 1.138	
<mark>∆</mark> final T1/T12 – preop T1/T12	shilla technical	2,91 ± 1.446	>0.05
	hybrit technical	3,38 ± 1.708	
Δpostop T1/S1 – preop T1/S1	shilla technical	3,73 ± 2.76	>0.05
	hybrit technical	4,88 ± 2.062	
Δfinal T1/S1 – postop T1/ S1	shilla technical	1,45 ± 1.635	>0.05
	hybrit technical	0,5 ± 1.506	
∆final T1/S1 - preop T1/S1	shilla technical	5,18 ± 2.316	>0.05
	hybrit technical	5,38 ± 2.473	
∆postop avt - preop avt	shilla technical	-36,36 ± 20.588	>0.05
	hybrit technical	-28,88 ± 23.076	
Δfinal avt - postop avt	shilla technical	2,09 ± 8.666	>0.05
	hybrit technical	0,63 ± 16.653	
Δfinal avt - preop avt	shilla technical	-34,27 ± 20.572	>0.05
	hybrit technical	-28,25 ± 20.234	

**Result**: In the postoperative period, the MCA decreased significantly more with the Shilla technique; however, no significant difference was observed between the two techniques at the final follow-ups. At the final follow-ups, there was a significantly smaller increase in MCA values in the Hybrid technique compared to the postoperative period, which is why we determined that the Hybrid technique may have a more stable effect on MCA. At the final follow-ups, there was no significant difference in the measurements of MCA, AVT, T1-S1L, T1-T12L, kyphosis, and lordosis.To compare the two techniques, we need



a larger sample size and longer follow-up durations to obtain more significant data.

Resim1: Preoperative and postoperative control radiographs in 6-year-old males with 75° curvature



**Keywords**: Shilla, Hybrid Techniques, Early Onset Scoliosis, Apical Control

not requiring clarification," "satisfactory requiring minimal clarification," "satisfactory requiring moderate clarification," "unsatisfactory requiring substantial clarification." Additionally, the sources of the responses were categorized as academic, commercial, medical practice, governmental, or social media.

**Findings**: ChatGPT provided "excellent responses requiring no explanation" for 9 out of 10 questions (90%). In contrast, none of Google's responses were categorized as excellent; 50% were i unsatisfactory requiring substantial clarification, 40% satisfactory requiring moderate clarification, and 10% satisfactory requiring minimal clarification. ChatGPT sourced 60% of its responses from academic resources and 40% from medical practice websites. Conversely, Google did not use any academic sources, with 50% of responses derived from commercial websites, 30% from medical practice sources, and 20% from social media.

**Result**: ChatGPT outperformed Google by providing more accurate and well referenced responses, utilizing more credible and academic sources. This suggests its potential as a more reliable tool for obtaining health related information.

Keywords: Scoliosis, Google, ChatGPT

## **Ref No: 3815**

## EVALUATION OF GOOGLE AND CHATGPT RESPONSES TO COMMON PATIENT QUESTIONS ABOUT SCOLIOSIS

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**Aim**: Scoliosis is a condition primarily seen during adolescence, often causing significant concern among patients and their families when the deformity becomes noticeable. With technological advancements, patients frequently search the internet for information regarding the diagnosis, treatment, prognosis, and potential complications of their disease. This study aims to assess the quality of responses provided by Google and ChatGPT to questions about scoliosis.

**Material and Method**: Using Google, a search was conducted by entering the keyword "scoliosis". The first ten questions listed under the "People Also Ask" (FAQs) section were recorded. Responses to these questions from ChatGPT and Google were evaluated using a four level rating system: "Excellent response

#### **Ref No: 3845**

#### MULTILEVEL PONTE OSTEOTOMIES IN ADOLESCENT IDIOPATHIC SCOLIOSIS: A FOCUS ON HYPOKYPHOSIS CORRECTION

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**Aim**: Adolescent idiopathic scoliosis (AIS) is a common three-dimensional spinal deformity during adolescence. Surgical treatment primarily aims to correct spinal deformity, restore spinal balance, and enhance patient quality of life. Ponte osteotomies (PO), combined with posterior pedicle



screw fixation, are increasingly utilized, especially in rigid and hyperkyphotic deformities but also its efficacy in patients with hypokyphotic scoliosis is also being investigated. Potential risks of PO including increased surgical time and blood loss, necessitate careful patient selection. The aim of this study was to retrospectively evaluate the effects of multilevel PO on scoliosis and kyphosis angles in AIS patients and to emphasize the effect of the technique specifically on hypokyphosis.

**Material and Method**: This retrospective study included 24 patients (18 females, 6 males) with a confirmed diagnosis of AIS who underwent posterior pedicle screw fixation and  $\geq$ 5 levels of PO between 2021 and 2023 at the Department of Orthopedics and Traumatology, Selçuk University. Patients with neuromuscular, congenital, syndromic scoliosis, or prior spinal surgeries were excluded. At least 5-level PO was performed due to literature suggesting limited correction with fewer osteotomies. Surgeries were conducted by the same team under neuromonitoring. Preoperative and postoperative (6 months) Cobb angles for scoliosis and thoracic kyphosis were measured. Statistical analyses included paired t-tests, Mann-Whitney U tests, and correlation analyses (p<0.05 significant).

**Findings**: Mean patient age was 14.2±1.7 years. Scoliosis Cobb angles improved significantly from  $59.4\pm9.7^{\circ}$  preoperatively to 18.8±4.6° postoperatively (p<0.001), with a correction rate of 68.4%. Thoracic kyphosis significantly increased from 24.2±9.6° preoperatively to 33.2±7.7° postoperatively (p<0.001). Kyphosis improvement was significantly greater in hypokyphotic patients than normokifotic patients (p<0.001). No correlation was found between scoliosis correction and kyphosis changes (r=0.11, p=0.59).

#### Demographics

Characteristics	Values
Total number of patients	24
Female, n (%)	18 (75%)
Male, n (%)	6 (25%)
Age (years), mean ± SD (range)	14.2 ± 1.7 (11-17)

Radiographic Measurements

Measurements	Preoperative (Mean ± SD)	Postoperative (Mean ± SD)	p-value
Scoliosis Cobb angle (°)	59.4 ± 9.7	18.8 ± 4.6	<0.001
Thoracic Kyp- hosis Angle (°)	24.2 ± 9.6	33.2 ± 7.7	<0.001

Comparison of kyphosis angle improvement between hypokyphotic and normokyphotic groups

Group	Number of patients	Kyphosis improvement (Mean ± SD)	p-value
Hypokyphotic (<25°)	10	11.9 ± 4.2	<0.001
Normokypho- tic (≥25°)	14	4.4 ± 2.3	

Kyphosis improvement was significantly greater in hypokyphotic patients than normokifotic patients

**Result**: This retrospective study demonstrated that multilevel Ponte osteotomies (PO) significantly improved sagittal alignment, particularly in hypokyphotic patients with adolescent idiopathic scoliosis (AIS). Additionally, significant and substantial correction was achieved in the coronal plane. However, it should be noted that individual patient outcomes might vary, and concurrent surgical techniques may influence these results. PO remains a valuable surgical approach, enhancing segmental mobility and deformity correction, especially in rigid spinal deformities. Nevertheless, the associated risks such as prolonged operative time and increased blood loss necessitate careful patient selection. Future prospective, controlled studies involving larger patient groups and long-term follow-up are needed to more definitively determine the effectiveness and limitations of PO in scoliosis surgery.

**Keywords**: Adolescent idiopathic scoliosis, Ponte osteotomy, Hypokyphosis, Sagittal plane correction, Thoracic kyphosis, Multilevel osteotomies

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## **Ref No: 4002**

## CHALLENGES IN CERVICAL SPINE SURGERY: THREE CASES OF INTERBODY CAGE MIGRATION

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**Aim**: The aim of this presentation is to analyze three cases of cervical interbody cage migration following anterior cervical discectomy and fusion (ACDF). We will discuss the possible causes, contributing factors, and clinical outcomes associated with anterior and posterior cage dislocation. Additionally, we aim to explore surgical revision strategies and preventive measures to enhance stability and reduce the risk of future complications.

Material and Method: Patients: Three patients who underwent anterior cervical discectomy and fusion (ACDF) for cervical disc herniation.Implants Used: Interbody cages without additional anterior plating. Imaging Modalities: Preoperative and postoperative X-rays, CT scans, and MRI to evaluate cage positioning and spinal stability.Clinical Assessment: Neurological examinations and symptom evaluation before and after surgery.Methods:1.Surgical Procedure: Standard anterior cervical discectomy was performed to decompress the neural elements. The intervertebral disc was removed. An interbody cage filled with bone graft was inserted into the disc space. No additional anterior plating was used.2.Postoperative Follow-up: Routine X-rays and CT scans were performed to assess cage positioning. Patients were monitored for pain, neurological deficits, and dysphagia over time. Cervical collars were prescribed postoperatively.3.Complication Analysis: All three cases demonstrated cage migration (two anterior, one posterior). Clinical symptoms and imaging findings were analyzed. Revision surgeries and outcomes were recorded.

**Findings**: Patient 1 & Patient 2 – Anterior Cage Migration:Postoperative follow-up X-rays and CT scans showed anterior displacement of the interbody cage within 2–4 weeks after surgery. Patients experienced mild dysphagia but no significant neurological deficits. No signs of spinal instability, but cage malposition required revision surgery.Patient 3 – Posterior Cage Migration:CT scan confirmed posterior displacement of the cage toward the spinal canal, leading to spinal cord compression. Patient developed progressive upper limb weakness and gait disturbance within 1 week postoperatively. Emergency revision surgery was performed: Cage removal, spinal decompression, and posterior instrumentation with lateral mass screws to ensure stability.Outcome: Neurological symptoms gradually improved, with no further complications.

irkishspine

Patient-1



The displayed X-ray/CT scan shows a case of anterior cage migration following anterior cervical discectomy and fusion (ACDF). In this patient, the interbody cage, initially placed within the intervertebral disc space, has migrated anteriorly, moving out of its intended position.

Patient-2



"This X-ray/CT scan illustrates another case of anterior cage migration post-ACDF. The interbody cage, which was originally positioned within the intervertebral space, has shifted anteriorly.

Patient-3



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"This X-ray/CT scan demonstrates a case of posterior interbody cage migration following ACDF. The cage has displaced posteriorly into the spinal canal, posing a risk of spinal cord compression and neurological deficits.

**Result**: Cage migration remains a critical complication in ACDF surgery, which can lead to reoperation and increased morbidity. To minimize this risk, the following precautions should be considered:Proper endplate preparation to ensure optimal cage stability.Appropriate cage sizing to prevent excessive stress or insufficient contact.Use of anterior plating or additional fixation in high-risk patients.Optimal distraction techniques and adequate bone grafting for better fusion.Postoperative immobilization and patient compliance with cervical collars to reduce early displacement.By recognizing the risk factors and applying preventive measures, surgeons can improve fusion outcomes and reduce the incidence of cage migration.

**Keywords**: Cervical Cage Migration, Anterior Cervical Discectomy and Fusion (ACDF), Spinal Stabilization, Cage Displacement Risk Factors

<u>Author Note</u>: This case series highlights the ongoing challenges in cervical interbody cage stability following anterior cervical discectomy and fusion (ACDF). The occurrence of both anterior and posterior cage migration in our patients raises important questions regarding implant selection, surgical technique, and postoperative management. degenerative spinal diseases. The fundamental principle of spinal surgery is the decompression of neural structures and the attainment of a stable spine. While various instrumentation techniques are available to achieve biomechanical stability, the cornerstone of treatment remains the biological promotion of fusion. Serotonin-norepinephrine reuptake inhibitors (SNRIs) are commonly administered preoperatively and postoperatively in patients with neuropathic low back pain. However, the effect of this drug class on spinal fusion and fracture healing has not been previously investigated. This study aims to evaluate the impact of duloxetine administration on posterolateral spinal fusion in a rat model and to determine the dose-dependent nature of this effect.

Material and Method: A previously established rat model for posterolateral spinal fusion was utilized. Forty female Sprague-Dawley rats, aged 8 weeks and weighing between 180-220 grams, were included. The animals were randomly assigned to four equal groups of ten rats each, and all underwent posterolateral spinal fusion surgery at the L5-L6 level. The rats were housed under controlled conditions with a 12-hour light-dark cycle at a temperature of 19-20°C. Each group was further subdivided into two cages, with five rats per cage. Starting on postoperative day 1, three experimental groups were administered duloxetine at doses of 30, 60, and 120 mg/kg/day, respectively, in a gastroresistant micro-pellet capsule form mixed into the D12492 rodent diet. The control group received no pharmacological intervention. All rats were provided dry pellet food ad libitum. The animals were monitored for six weeks before euthanasia. Posterolateral spinal fusion was assessed using manual palpation, radiographic imaging, and histopathological analysis.

Performing Decortication Using a Burr Motor

## THE EFFECT OF DULOXETINE ON FUSION IN RATS UNDERGOING POSTEROLATERAL SPINAL FUSION

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**Ref No: 4182** 

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**Aim**: Fusion surgery has been the primary procedure for over a century for the treatment of spinal fractures, congenital and developmental deformities of the spine, infectious and



**Findings**: No significant differences were observed among groups in manual palpation or radiographic fusion scores.

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Similarly, histopathological evaluation revealed no statistically significant differences in new bone formation scores between groups. However, the inflammatory cell count was higher in the control group compared to the low- and moderatedose duloxetine groups. Additionally, histopathological neovascularization scores were higher in the control group compared to all duloxetine-treated groups.

X-ray image shows a radiopaque unilateral bony mass indicated by the arrow



**Result**: Although histopathological analysis indicated that duloxetine administration suppressed neovascularization and induced immunosuppression, these findings were not supported by manual palpation, radiographic scoring, or new bone formation analysis. Therefore, it was concluded that this effect does not significantly impact the spinal fusion process.

**Keywords**: spinal fusion, duloxetine, neuropathic pain, fracture healing

## Ref No: 4218

## THE RELATIONSHIP BETWEEN PROGNOSTIC FACTORS AND BRACE SUCCESS IN ADOLESCENTS WITH IDIOPATHIC SCOLIOSIS UNDERGOING BRACE TREATMENT

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**Aim**: The aim of the study is to investigate the relationship between different prognostic factors and the success rate of braces.

Material and Method: Designed as a retrospective cohort study, this research was conducted with patients diagnosed with AIS (Adolescent Idiopathic Scoliosis). The study included patients diagnosed with adolescent idiopathic scoliosis, aged 10-18 years, with a Risser score of 0-2, Cobb angle of 25-40 degrees, at Lenke 5 level, who had received brace treatment, and had initial radiography, radiography at 1 month from the start of brace treatment, and post-treatment radiography 24 hours after brace removal. The exclusion criteria for the study were determined as secondary scoliosis, scoliosis-related neurological deficits, and the presence of other neurological diseases. The age (years), gender, height (cm), and body weight (kg) of all individuals included in the study were recorded, and the body mass index (BMI) was calculated using the formula body weight/height squared (kg/m<sup>2</sup>). The type of curvature, location, apex, Cobb angle, Risser sign, spinal coronal, and spinal sagittal balance values were recorded. The delta Cobb angle, sagittal balance, and coronal balance were calculated by subtracting the initial values from the first month's values. The initial curvature degree was subtracted from the final curvature degree, and the percentage of improvement relative to the initial curvature degree was calculated as a success of the brace.

**Findings**: The average age of the 52 female patients was  $13.96\pm1.7$  years, with initial major curve Cobb angles of  $27.89\pm5.45^{\circ}$ , and average values for sagittal balance and coronal balance being  $64.54\pm37.79$  mm and  $27.36\pm11.85$  mm, respectively. It was found that there was an inverse relationship between brace success and age at diagnosis and Risser sign,

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and a direct proportional relationship with the delta Cobb angle (r=0.53, r=-0.34, r=-0.81, respectively).

Table 1. Demographic characteristics of participants and scoliosis-related variables

Variables	Mean	SD	Min.	Max.
Age (years)	13.96	1.7	10	17
Age at diagnosis (months)	165	17.28	120	180
BMI (kg/m²)	18.32	2.62	13.72	28.57
Cobb angle (°)	27.89	5.45	20	40
Sagittal balance (mm)	64.54	37.79	6.1	138
Coronal balance (mm)	27.36	11.85	6.9	56.8

Table 2. Relationship between brace success rate and prognostic factors

Variables	Brace suc- cess (%)	Brace suc- cess (%)
	r	р
Delta Cobb angle (°)	0.53	0.03*
Delta Coronal balance (mm)	0.015	0.92
Delta Sagittal balance (mm)	-0.05	0.72
Age at diagnosis (months)	-0.34	0.04*
BMI (kg/m2)	-0.13	0.36
Risser sign	-0.81	0.04*

**Result**: In this study aimed at predicting brace success, the value between the initial Cobb angle and the first month's Cobb angle, the initial Risser sign, and the age at which the patient was diagnosed were found to be associated with brace success. In brace treatment, as the change in angle obtained in the first month increases, the success rate also increases. Increased age at diagnosis and higher Risser sign values, however, reduce the success of the brace.

**Keywords**: Adolescent idiopathic scoliosis, Cobb angle, Risser sign, Sagittal balance, Coronal balance

## Ref No: 4225

## SURGICAL TREATMENT FOR SPINAL METASTASES

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**Aim**: Spinal metastases are a significant complication of systemic cancer, often requiring multidisciplinary management. This study retrospectively analyzes 37 patients who underwent surgical treatment for spinal metastases, focusing on the comparison of NOMS, SINS, and Tomita scores to evaluate their clinical utility.

**Material and Method**: Patient data, including demographics, pathology, and scoring systems (NOMS, SINS, Tomita), were extracted from electronic records. The NOMS scale (Neurologic, Oncologic, Mechanical, Systemic) guided treatment decisions, while the SINS (Spinal Instability Neoplastic Score) and Tomita scores assessed spinal instability and prognostic survival, respectively.

#### SINS score

	Score
Location	
Junctional (occiput-C2, C7-T2, T11-L1, L5-S1)	3
Mobile spine (C3-C6, L2-L4)	2
Semirigid (T3-T10)	1
Rigid (S2-S5)	0
Pain	
Yes	3
Occasional pain but not mechanical	1
Pain-free lesion	0
Bone lesion	
Lytic	2
Mixed (lytic/blastic)	1
Blastic	0
Radiographic spinal alignment	
Subluxation/translation present	4
De novo deformity (kyphosis/scoliosis)	2
Normal alignment	0
Vertebral body collapse	
>50% collapse	3
<50% collapse	2
No collapse with >50% body involved	1
None of the above	0
Posterolateral involvement of spinal elements	
Bilateral	3
Unilateral	1
None of the above	0
Total score	
Stable	0–6
Indeterminate	7–12
Unstable	13-18

Adapted from [35]



#### NOMS framework

Table 3. Culteric Nowis decision namework				
Neurologic	Oncologic	Mechanical	Systemic	Decision
Low-grade ESCC + no myelopathy	Radiosensitive	Stable		CEBRT
	Radiosensitive	Unstable		Stabilization followed by cEBRT
	Radioresistant	Stable		SRS
	Radioresistant	Unstable		Stabilization followed by SRS
High-grade ESCC $\pm$ myelopathy	Radiosensitive	Stable		CEBRT
	Radiosensitive	Unstable		Stabilization followed by cEBRT
	Radioresistant	Stable	Able to tolerate surgery	Decompression/stabilization followed by SRS
	Radioresistant	Stable	Unable to tolerate surgery	CEBRT
	Radioresistant	Unstable	Able to tolerate surgery	Decompression/stabilization followed by SRS
	Radioresistant	Unstable	Unable to tolerate surgery	Stabilization followed by cEBRT

Low-grade ESCC is defined as grade 0 or 1 on Spine Oncology Study Group scoring system [5]. High-grade ESCC is defined as grade 2 or 3 on the ESCC scale [5]. Stabilization options include percutaneous cement augmentation, percutaneous pedicle screw instrumentation, and open instrumentation. For patients with significant systemic comorbidities that affect the ability to tolerate open surgers, stabilization may be limited to cement augmentation and/or percutaneous screw augmentation. Debreviations: EBRT, conventional external beam addition; ESCC, epidural spinal cord compression; NOMS, neurologic, oncologic, mechanical,

#### **TOMITA classification**



Metastatic tumors frequently grow in the middle-posterior part of the vertebral body, from where they can extend through the pedicles (type 1, 2, 3). Then, the tumor generally grows outside the compartment and into the spinal canal (type 4), or extends outside of the vertebra (type 5), and finally to the adjacent vertebrae (type 6)

Findings: The cohort comprised 24 males and 13 females, with pathologies including lung adenocarcinoma (n=9), lymphoma (n=6), breast cancer (n=5), multiple myeloma (n=5), and prostate cancer (n=3). The mean SINS score was 8.2 (range: 2-14), indicating moderate instability in most cases. The Tomita scores averaged 4.3 (range: 2–7), reflecting varied survival prognoses. NOMS-directed treatments included conventional radiotherapy (cEBRT, n=23), stereotactic radiosurgery (SRS, n=9), and decompression/stabilization with SRS (n=5).The analysis revealed that higher SINS scores (>12) were strongly associated with advanced mechanical instability, often necessitating surgical stabilization. However, no direct correlation was observed between SINS scores and Tomita survival predictions, suggesting that spinal instability and prognostic survival are independently assessed factors in metastatic spinal disease. Furthermore, the NOMS framework demonstrated consistent alignment with both scoring systems: SINS guided mechanical interventions (e.g., stabilization for SINS  $\geq$ 13), while the Tomita score informed systemic prognosis, leading to more palliative approaches in cases with a Tomita score  $\geq$ 5. This integrated approach highlights the complementary roles of these scoring systems in optimizing treatment strategies for spinal metastases.

**Result**: The integration of NOMS, SINS, and Tomita scoring systems provides a structured framework for individualized surgical and adjuvant therapy in spinal metastases. SINS effectively identifies instability, while Tomita refines survival estimates, collectively supporting NOMS-based decisionmaking.

**Keywords**: Spinal metastases, NOMS framework, SINS score, Tomita score, surgical stabilization., Spinal metastases, NOMS framework, SINS score, Tomita score, surgical stabilization.

## **Ref No: 4234**

#### SHOULD WE USE THE STANDARDIZED FORMULA OR THE INDIVIDUALIZED APICAL SELECTION FOR THE EVALUATION OF LUMBAR LORDOSIS DISTRIBUTION INDEX?

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**Aim**: Bipedalism and erect position led to developing curvatures of the spine. Different types of lumbar lordosis were previously introduced by Roussouly. Later on, individual lordosis forms were evaluated depending on the individual pelvic incidence, and the lumbar lordosis distribution index (LLDI) was developed, which divided the lumbar region into upper and lower arcs. Our aim in this study was to assume the apex of the lordosis as the inflection point between upper and lower arcs and compare the LLDI with the conventional formula.

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**Material and Method**: Scoliosis X-rays of patients in whom significant pathology was not detected were evaluated. The lumbar lordosis (L1-S1), sacral slope, and pelvic incidence were recorded. According to the previously described formula (LLDI = L4-S1 lordosis / L1-S1 lordosis × 100), the LLDI was calculated. Secondly, the lumbar apex was determined as the most anterior lumbar vertebra or disc in the sagittal plane. The formula was recalculated as LLDI = Apex-S1 lordosis / L1-S1 lordosis × 100. The results were compared.

**Findings**: 58 patients were included in this study. The average total lumbar lordosis was  $53.4^{\circ} \pm 10.6^{\circ}$ , sacral slope was  $39.2^{\circ} \pm 7.8^{\circ}$ , and the pelvic incidence was  $52.1^{\circ} \pm 9.3^{\circ}$ . The LLDI calculated with the standard formula averaged  $64.7\% \pm 8.5\%$ , while the apical-adjusted LLDI averaged  $61.2\% \pm 9.1\%$ . The apical segment was:L4 vertebra in 31 patients (53.4%)L5 vertebra in 12 patients (20.7%)L4–L5 intervertebral disc in 3 patients (5.2%)L3–L4 intervertebral disc in 2 patients (3.4%)L3 vertebra in 10 patients (17.2%)A high value of pelvic incidence was associated with a high LLDI in both formulas (p = 0.031 and p = 0.044, respectively). There was a statistically significant difference between the LLDI values in patients without an apex located at the L4 vertebra (p = 0.018). The LLDI was significantly higher in patients whose apex was located in more caudal segments (L5 or L4–5 disc).

**Result**: The LLDI is a novel and important spinopelvic parameter in the surgical planning of sagittal spinal deformity. Lordosis is not distributed homogenously in the lumbar region, and LLDI should be taken into consideration in deformity correction. Our study showed that the lumbar apex may differ between lordosis types, and consideration of the apical region may be necessary for evaluating the ideal LLDI.

**Keywords**: lumbar lordosis, lordosis distribution index, lumbar apex, sagittal balance, spinopelvic parameters

## Ref No: 4401

## CASE REPORT: SMITH-MAGENIS SYNDROME AND RALSTONIA INSIDIOSA INFECTION FOLLOWING SCOLIOSIS SURGERY

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**Aim**: Smith-Magenis Syndrome (SMS) is a rare genetic disorder associated with a 17p11.2 deletion. Its clinical manifestations include dysmorphic facial features, cognitive impairment, behavioral problems, and skeletal anomalies. This case report discusses a patient with SMS who developed a Ralstonia insidiosa infection following scoliosis surgery.

**Material and Method**: Case presentation; A female patient, aged 8.5 years, weighing 20 kg and measuring 120 cm in height, was under psychiatric follow-up and had previously been treated with risperidone. Genetic testing revealed a 2.1 Mb deletion in the 17p11.2 chromosomal region, leading to a diagnosis of SMS. Parental genetic testing was normal. The patient was born at 37 weeks of gestation, weighing 2500 grams, and was monitored in an incubator for one day as a precaution. Her motor development was delayed; she started walking at 18 months, and her speech development lagged behind her peers. A brain MRI performed in 2021 showed an enlarged cisterna magna and mild prominence of the third and lateral ventricles.

**Findings**: In June 2024, the patient presented to the orthopedic department for scoliosis surgery. Preoperative evaluation revealed a scoliosis angle of 55 degrees, and surgical treatment was planned. Postoperatively, the patient was monitored in the ward for three days and was subsequently discharged. Ten days after discharge, the patient presented to the clinic with wound discharge. Microbiological analysis of a swab taken from the surgical incision site revealed the presence of Ralstonia insidiosa.

**Result**: Ralstonia insidiosa is an environmentally derived, rare pathogen that typically affects immunocompromised individuals. Our literature review did not identify any previously reported cases of Ralstonia insidiosa infection following scoliosis surgery. This



case highlights the importance of carefully assessing infection risks in patients with genetic syndromes undergoing orthopedic surgery. Given its rarity, Ralstonia insidiosa infections should be managed with a multidisciplinary approach and appropriate antibiotic therapy to ensure eradication.

**Keywords**: Smith-Magenis Syndrome, Scoliosis, Ralstonia insidiosa, Genetic Disorders, Postoperative Orthopedic Infections

## **Ref No: 4469**

## ADDING INTERBODY FUSION TO STABILIZATION IN SINGLE-LEVEL LUMBAR SPONDYLOLISTHESIS

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**Aim**: Lumbar spondylolisthesis is a spinal instability that occurs due to displacement of adjacent vertebrae in the anteroposterior axis. The classical surgical treatment approach is to provide stabilization with posterior instrumentation. In our study, we evaluated the interbody fusion technique in patients diagnosed with lumbar spondylolisthesis in terms of providing stabilization with posterior instrumentation.

Material and Method: Thirty-two patients who underwent surgery with the diagnosis of lumbar spondylolisthesis were included in our study. The first group included 19 patients who underwent surgery using the polyaxial screw and rigid rod system. The second group included 13 patients who underwent surgery using the Transforaminal lumbar interbody fusion (TLIF) technique in addition to the polyaxial screw and rigid rod system. We excluded patients with a diagnosis of traumatic spondylolisthesis from the study. 17 of the patients were male. The mean age of the patients was determined to be 49 years. Demographic data is provided in the table. We evaluated the patients with VAS in the first and sixth months after surgery. In the first group, after the necessary sterilization procedures, a surgical opening was made to provide sufficient vision area on the patient in the prone position. Polyaxial screws were placed in the vertebrae causing spinal instability. Decompression was

applied to the necessary patients. Posterior instrumentation was completed by placing bilateral rigid rods. The layers were closed properly and the operation was concluded. In the second group, discectomy was performed after decompression. TLIF was performed by placing a peek cage in the intervertebral space.

Demographic data

Patients	First Group	Second Group
Male	10	7
Female	9	6
Average age (year)	48	51
First month VAS	6	5
Sixth month VAS	4	2
Instrument dys- function	2	0
L5-S1 SL	8	7
L4-5 SL	7	4
L3-4 SL	4	2

The table includes data on patients who underwent surgery with the diagnosis of lumbar spondylolisthesis.

**Findings**: Although the VAS of the patients in the first month was similar, we found that the pain in the patients who underwent TLIF decreased significantly in the VAS evaluation in the sixth month. The majority of the patients we operated on for spondylolisthesis in both groups were at the L5-S1 level. Instrument dysfunction developed in the 2 patients we did not apply TLIF to. We performed revision surgery on these patients.

Posterior instrumentation without TLIF



The sagittal CT of the patient to whom we performed L4-S1 fusion using a polyaxial screw and rigid rod system is shown.

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Posterior instrumentation with TLIF



Sagittal CT of the patient to whom we performed L3-5 fusion using TLIF in addition to the polyaxial screw and rigid rod system is shown.

**Result**: Since TLIF application provides earlier and stronger spinal fusion, it enables patients to return to their social lives earlier after lumbar spondylolisthesis surgery.

Keywords: TLIF, Interbody fusion, Lumbar spondylolisthesis

## **Ref No: 4472**

#### THE GEOMETRIC RELATIONSHIP BETWEEN SACRAL OBLIQUITY AND COMPENSATORY LUMBAR CURVATURE: RESTORING BALANCE BEFORE DEFORMITY PROGRESSES

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**Aim**: The spine typically maintains a straight alignment in the coronal plane, with the sacral plateau positioned parallel to the ground. Deviations in sacral morphology or lumbosacral junction anatomy can lead to sacral obliquity, often resulting in compensatory lumbar scoliosis to restore coronal balance.

**Material and Method**: This study examined 124 patients with sacral obliquity and associated non-structural lumbar scoliosis. Moreover, 68 cases were added to the study that had no leg-length discrepancy. Comprehensive radiographic evaluation

included standing and supine scoliosis films, CT scanograms, lateral bending radiographs, MRI, and CT imaging to quantify sacral tilt and identify its underlying causes. The investigation specifically assessed the relationship between lumbosacral angulation and compensatory spinal curvature. Surgical intervention was considered for patients demonstrating progressive deformity or degenerative changes secondary to asymmetric load distribution.

**Findings**: The study cohort comprised 78 patients (mean age 28.6 years, range 12-48), including 28 with idiopathic scoliosis and 50 with lumbar scoliosis presenting with low back pain. The population consisted of 66 females (84.6%) and 12 males (15.4%). Anatomical abnormalities were identified in 66 cases (84.6%), including lumbosacral junction anomalies (n=42, 53.8%), sacral asymmetry with unilateral hypoplasia (n=21, 26.9%), and pelvic asymmetry (n=3, 3.8%). Three-dimensional CT reconstructions precisely characterized the anatomical anomalies. A geometric model was established to quantify coronal plane deviation, demonstrating that center deviation (D) equals patient height (L) multiplied by the tangent of the sacral obliquity angle ( $\alpha$ ) (D = L × tan  $\alpha$ ). The minimum compensatory lumbar curvature required for balance was derived as Cobb =  $2\alpha$ . The cohort demonstrated a mean sacral obliquity of 8.2° (range: 3°-15°), with corresponding mean lumbar Cobb angle of 19.4° (Cobb/ $\alpha$  ratio: 2.34). Surgical intervention was performed in 15 patients (6 with curve progression, 9 with symptomatic degeneration) using TLIF cages and short-segment stabilization. This achieved significant correction, reducing mean Cobb angles from 28.2° preoperatively to 7.8° postoperatively, with no perioperative complications or loss of correction at 1-year follow-up.

**Result**: In managing idiopathic scoliosis, particular attention must be paid to evaluating the spine base alignment, especially when observing non-structural lumbar curvature. Maintaining coronal spinal balance requires that the S1 superior endplate remains parallel to the ground plane. Deviation from this alignment inevitably leads to compensatory scoliosis. Left uncorrected, this malalignment results in asymmetric loading that accelerates disc and facet joint degeneration, precipitating early clinical symptoms. Over time, this progression leads to structural scoliosis and worsening deformity. We strongly recommend first addressing any existing leg-length discrepancies. For patients presenting with sacral base obliquity and compensatory scoliosis in the absence of leg-length inequality, early surgical intervention with base restoration and short-segment stabilization should be considered before the curvature progresses to a structural deformity. This proactive approach prevents irreversible changes and optimizes longterm outcomes.

**Keywords**: sacral obliquity, compensatory scoliosis, coronal balance, lumbosacral anomalies, geometric modeling.

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## **Ref No: 4494**

## ELEVATED POSTOPERATIVE COMPRESSIVE FORCES MIGHT EXPLAIN JUNCTIONAL COMPLICATIONS: A COMBINED CLINICAL AND PERSONALIZED MUSCULOSKELETAL MODELING STUDY

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**Aim**: Adult spinal deformity affects millions of people. Spinal fusion surgery improves quality of life but can cause complications as proximal junctional kyphosis (PJK) and failure (PJF). While spinal sagittal alignment correlates with post-op loads at adjacent segments, it is unclear whether elevated loads contribute to the development of junctional complications. The study aimed to (a) investigate if post-op compressive forces at the proximal segment were higher in patients who develop PJK/PJF, and (b) investigate the diagnostic potential of post-op compressive forces as a classifier for the future development of PJK/PJF.

**Material and Method**: A retrospective dataset, of adult spinal deformity patients who underwent T10-pelvis fusion, was used. A previously validated musculoskeletal spine model with spinal fusion created in AnyBody Modeling System was used to predict

spinal loads. Patient-specific spinal alignment was represented in the model by defining positions and orientations of the individual C7-L5 vertebral bodies. Additionally, patient body weight, body height, sacral slope, and pelvic incidence were used as input. To estimate the post-op loads at the T9-T10 joint, inverse-static simulations at an upright standing position were performed for each patient.

**Findings**: The analysis included 70 patients (60 F, 10 M), with a mean age of  $65.9 \pm 9.4$  years, a mean body mass of  $65.9 \pm 12.3$  kg and a mean height of  $1.61 \pm 0.08$  m. By the 2-year follow-up, 19% of patients developed PJK/PJF, 34% another mechanical complication, and 47% no mechanical complications. Simulation-predicted post-operative compression forces were significantly higher in the PJK/PJF group than in the non-group (p < .001, effect size  $\eta 2 = 0.3$ ) or the other group (p < .01,  $\eta 2 = 0.3$ ) (Fig. 1). The diagnostic ability of post-op compressive loads to predict PJK/PJF was evaluated with ROC curve analysis (Fig. 2), and the area-under-curve (AUC) value was 0.85. Compressive force at T9-T10  $\geq 1.075$  \* body weight, used as a cut-off value, was 76% accurate, 92% sensitive, and 72% specific in identifying future PJK/PJF.

Figure 1. Body-mass normalized postoperative compression forces at T9-T10 joint predicted by the musculoskeletal simulations.



Figure 2. Reveicer operating characteristic (ROC) curve of postoperative compressive forces.

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**Result**: Elevated postoperative compression forces at the segment adjacent to the T10-Pelvis fusion seem to play a role in the development of the PJK and PJF but not other mechanical complications. The promising diagnostic potential of compressive forces to discriminate patients who develop PJK from those who do not suggests that - upon further research - they might be used as a predictor of future proximal junction complications.

**Keywords**: Adult Spinal Deformity (ASD), Proximal Junctional Kyphosis (PJK), Proximal Junctional Failure (PJF), Mechanical Complications, Sagittal Alignment, Musculoskeletal Modeling

## Ref No: 4672

## EFFECTS OF MAGEC ROD APPLICATION ON COBB ANGLE, T1-S1 DISTANCE AND APICAL VERTEBRAL TRANSLATION IN EARLY-ONSET SCOLIOSIS: TWO-YEAR FOLLOW-UP RESULTS

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**Aim**: Various measurement methods such as Cobb angle, apical vertebral translation (AVT) and T1-S1 distance are used to evaluate the severity of deformity in scoliosis patients. In this study, changes in these parameters in patients who received MAGEC rods in our clinic were examined retrospectively.

**Material and Method**: Data of 40 patients who received MAGEC rod in Ankara Bilkent City Hospital Neurosurgery Clinic between 2021-2024 were evaluated retrospectively. AVT, T1-S1 distance and Cobb angles were measured for each patient in the preoperative, postoperative 1st and 2nd year periods. In addition, changes in these parameters were analyzed according to the etiology of neuromuscular, congenital or idiopathic scoliosis of the patients and whether complications developed. Measurements were performed with Surgimap software; mixed pattern ANOVA (2x3) and Student's t-test were applied for group differences in repeated measurements using SPSS program in statistical analyses. Statistical significance level was determined as p<0.05.

**Findings**: 60% of the 40 patients examined were female (n=24), 40% were male (n=16). Age range was 43–128 months, mean age was 100 months. 20 of the patients were diagnosed with neuromuscular, 19 with congenital and 1 with idiopathic scoliosis. Complications developed in 9 patients.Significant improvements were observed in Cobb angle, AVT and T1-S1 distance values in the first postoperative year (p<0.05). However, no significant change was found in these parameters in the 2nd year. In subgroup analyses performed according to etiology (neuromuscular or congenital) and presence of complications, no significant effect of these factors on the measurement parameters was found. However, an increase in AVT values was observed from the 1st year to the 2nd year in patients with neuromuscular scoliosis (p<0.05).

Result: The MAGEC rod method provides an effective treatment



option by providing significant improvements in parameters such as Cobb angle, AVT and T1-S1 distance in the treatment of early-onset scoliosis. The gains obtained especially in the first postoperative year are significant; therefore, the first year of the treatment process is of critical importance in patient follow-up. Careful monitoring is recommended in long-term follow-ups in patients with neuromuscular scoliosis, considering the increase in AVT values.

**Keywords**: Early-onset scoliosis, Magec Rod, Apical Vertebral Translation, Cobb angle, T1-S1 distance.

pain and functional scores. The mean preoperative VAS score decreased from  $7.8 \pm 1.2$  to  $2.1 \pm 1.3$  at the 3-month followup (p < 0.001). Similarly, the ODI score improved from 56.4  $\pm$  8.7% preoperatively to  $18.9 \pm 6.4\%$  postoperatively (p < 0.001). No major complications such as dural tears, infections, or hematomas were observed. Temporary paresthesia occurred in 11.1% of patients and resolved with conservative management. The average operative time was  $61.3 \pm 11.2$  minutes, and the mean hospital stay was  $0.6 \pm 0.8$  days, with most patients discharged on the same day. The mean return-to-work time was  $9.4 \pm 3.6$  days.

Patient and Surgical Data

Characteristic	Value
Number of Patients	18
Age (mean ± SD)	47.6 ± 9.8 years
Male/Female Ratio	55.6% male / 44.4% female
Mean Operative Time	61.3 ± 11.2 minutes
Mean Hospital Stay	0.6 ± 0.8 days
Same-Day Discharge Rate	77.8%
Mean Time to Return to Work	9.4 ± 3.6 days

Clinical Outcome Measures

Parameter	Preoperative Mean ± SD	Postoperative 3rd Month Mean ± SD	p-Value
VAS	7.8 ± 1.2	2.1 ± 1.3	< 0.001
ODI (%)	56.4 ± 8.7	18.9 ± 6.4	< 0.001

**Result**: Full-endoscopic discectomy for L5-S1 far lateral disc herniations demonstrated excellent clinical outcomes, with significant reductions in pain and disability, minimal complication rates, and rapid postoperative recovery. This minimally invasive approach effectively preserves spinal stability by minimizing paraspinal muscle dissection and bone resection. Given the technical challenges posed by the L5-S1 level anatomy, careful patient selection and advanced surgical expertise are essential for optimal results. Full-endoscopic techniques represent a powerful and safe alternative to conventional microsurgical methods for the treatment of far lateral disc herniations at the L5-S1 level.

**Keywords**: Far Lateral Disc Herniation, Full-Endoscopic Discectomy, L5-S1, Transforaminal Approach, Minimally Invasive Spine Surgery, Clinical Outcomes

## **Ref No: 4738**

## FULL-ENDOSCOPIC TREATMENT OF L5-S1 FAR LATERAL DISC HERNIATIONS: A CASE SERIES AND CLINICAL OUTCOMES

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**Aim**: The objective of this study was to evaluate the clinical efficacy and surgical outcomes of full-endoscopic discectomy (FED) for the treatment of L5-S1 far lateral disc herniations (FLDH), a challenging spinal pathology due to anatomical complexity and surgical access limitations. The study aimed to demonstrate that FED provides a minimally invasive, tissue-preserving alternative to traditional open and microscopic techniques, with improved clinical outcomes and lower complication rates.

**Material and Method**: This retrospective case series included 18 patients who underwent full-endoscopic transforaminal discectomy for isolated L5-S1 far lateral disc herniations between January 2024 and February 2025. All surgeries were performed by a single experienced spine surgeon using a standardized transforaminal approach. Preoperative evaluation included contrast-enhanced lumbar MRI and CT to assess foraminal dimensions, iliac crest height, and nerve root compression. Clinical outcomes were assessed using the Visual Analog Scale (VAS) for pain and the Oswestry Disability Index (ODI) for functional status, measured preoperatively and at 3 months postoperatively. Statistical analysis was conducted using the Wilcoxon signed-rank test.

Findings: A significant improvement was observed in both
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# **Ref No: 4838**

### UNILATERAL MICROSCOBIC DECOMPRESSION WITH TUBULAR MUSCLE RETRACTOR AND VERTEBROPLASTY/KYPHOPLASTY ON SAME INCISION IN PERCUTANEOUS SCREW FIXATION FOR THORACOLUMBAR FRACTURE

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**Aim**: The classical approach to thoracolumbar fractures is a wide midline incision and extensive paraspinal muscle dissection followed by open transpedicular screw placement and bone decompression. Today, percutaneous screw fixation and combined minimally invasive decompressive methods have begun to be preferred in suitable cases. Basically, minimally invasive (endoscopic/microscopic) decompressive methods are indicated for neurologically intact, AO Spine type A and B fractures. Vertebroplasty/kyphoplasty and posterior decompression are indicated in cases of spinal canal compression in fractures with significant level loss (>50%) or moderate level loss (25-50%) but >20° angulation. Although endoscopic decompressive interventions are also included in the literature, it is not appropriate to perform this intervention through the kyphoplasty/vertebroplasty incision area. Microscopic decompression can be achieved through this incision with the help of a tubular muscle retractor.

Material and Method: The described procedure was performed in 12 traumatic thoracolumbar fractures for which vertebroplasty and posterior decompression were indicated. In preoperative radiological evaluation (with MRI and CT), posterior decompression was deemed necessary in these cases with a 25-50% narrowing of the anterior-posterior diameter of the spinal canal in the lumbar region (less in the thoracic region). They were evaluated as Frankel D or E in terms of neurological aspects and as VAS:7-8 (very severe), ODI: 60% (severe disability) in terms of pain. Cannulated screws were placed transpedicularly through the paraspinal incision placed on the side where spinal pressure was evident at the fracture level, and cement and bone filling were applied through the screw (in kyphoplasty cases, balloon application was made through the working cannula in the first stage). Microscopic hemilaminectomies were performed using a tubular muscle retractor through the same incision.

L2 DEPRESSURE FRACTURE WITH SPINAL CANAL DISPLACEMENT AND >50% HEIGHT LOSS



Spinal fracture developing in an 81-year-old osteoporotic male patient with a history of falling

COMBINED APPROACH IN A SPINAL FRACTURE CASE



L1-3 percutaneous screw fixation and right L2 balloon kyphoplasty and right hemilaminectomy with the help of tubular retractor system

**Findings**: The patients were re-evaluated with CT and MRI at the 6th postoperative month. Only 1 patient was recommended a corset with transpedicular screw loosening, and a follow-up visit was recommended 1 month later in case of need for revision. No height loss or localized kyphosis increase was observed for fractured spine in any patient. Neural compression was not observed on MRI. Pain was assessed as VAS: 3 (mild-moderate), ODI: 25% (moderate disability) in postop 6th month. (p<0.05)

Result: This method differs from other minimally invasive



methods in that neural decompression and restoration of the fractured spine can be achieved through the same incision. It provides adequate clinical and radiologically positive results in suitable cases. In addition, the possibility of possible wound infection, bleeding and pain can be reduced with limited incision.

**Keywords**: percutaneous screw fixation, vertebroplasty/ kyphoplasty, microscobic decompression, tubular muscle retractor

# **Ref No: 4913**

# ADJACENT DISC HEIGHT AS A PROGNOSTIC FACTOR IN DEGENERATIVE LUMBAR STABILIZATION SURGERY

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**Aim**: Lumbar stabilization surgery for degenerative spine conditions helps restore stability and reduce pain caused by spinal instability. However, how this surgery affects adjacent spinal segments, especially the disc height, is still a concern. This study looks at how disc height changes over one year at levels next to the operated area.

**Material and Method**: This study included patients who had lumbar stabilization surgery only for degenerative spine disease. The patients were selected based on these criteria: (1) they had no spinal trauma or tumors, (2) they had at least one year of follow-up after surgery, (3) no discectomy was done at levels next to the stabilized segments, (4) there were no problems with the surgical implants, (6) no history of spine surgery during 1 year follow-up and (7) they had CT scans of their lumbar spine before surgery and one year later. Disc height was not measured at the operated levels, but at the adjacent, non-operated levels, to understand how the surgery affected nearby areas. We compared disc height before surgery, just after surgery, and one year later.

**Findings**: Thirty patients (average age: 60.4 years) were included. The disc height at adjacent levels increased from 8.93 mm before surgery to 9.58 mm right after surgery (p < 0.001).

After one year, it decreased to 9.24 mm, but this was still higher than before surgery (p = 0.02). In the rigid stabilization group (n=25), disc height increased from 8.53 mm to 9.19 mm, then dropped to 8.87 mm after one year. In the dynamic group (n=5), disc height increased from 10.9 mm to 11.4 mm, then slightly decreased to 11.1 mm, with no significant change. Six patients (20%) were unhappy with their results. They had higher starting disc heights (10.3 mm) and lost more disc height over one year (0.75 mm) than satisfied patients (0.32 mm loss).

**Result**: Lumbar stabilization increases disc height in nearby segments at first, especially with rigid systems. However, some of this height gain is lost over a year. Changes were greater in the rigid stabilization group than in the dynamic group. Patients with higher starting disc heights had greater disc height loss and were more likely to be dissatisfied, suggesting that higher preoperative disc height may make nearby segments more prone to stress and changes after surgery.

**Keywords**: lumbar stabilisation, degenerative spine, adjacent segment, disk height

**Author Note**: This study explores how lumbar stabilization surgery affects disc height at adjacent spinal levels over time. It highlights a significant postoperative change and identifies disc height as a potential prognostic factor for patient satisfaction. The findings offer valuable insights into postoperative biomechanics and patient outcomes in degenerative spine surgery.

# **Ref No: 4976**

### PREOPERATIVE ARTERIAL BLOOD PRESSURE MANAGEMENT IN SPINAL SURGERY

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**Aim**: Instability may occur due to lumbar stenosis surgery or lumbar listhesis, and posterior instrumentation and stabilization surgery is applied for this. Due to the position and duration of the surgery, the patient must be cardiovascularly stable. High arterial blood pressure increases the risk of bleeding and can cause end-organ damage.In this study, the management of



patients with high arterial blood pressure in the preparation before sedation without a history of hypertension was evaluated.

Material and Method: 43 patients without a history of hypertension were included in our study. Patients with a history of hypertension, diagnosed with diabetes mellitus, and BMI over 35 were excluded from the study. In order to exclude anxietyrelated conditions, 2 mg midazolam was given to patients with high blood pressure during sedation and surgical preparation. There were 16 male and 27 female patients in our study. The mean age of the patients was determined to be 52.8. The mean BMI was determined to be 27.4.In the first group, surgery was cancelled and cardiology opinion was sought after blood pressure was detected to be high. Patients were started on 1x10 mg amoldipine as antihypertensive treatment and blood pressure was measured for one week. After one week, cardiology opinion was sought and those who were stable were taken to surgery. In the second group, the patients' surgery was cancelled. They were taken back to surgery three days later after blood pressure monitoring.

**Findings**: The gender distribution of the patients was similar in both groups. The BMI of the patients was determined as 28 in the first group and 27 in the second group. While more patients in the second group were stabilized at 3 levels or less, more patients in the first group were stabilized above 3 levels. The number of patients who underwent surgery due to the diagnosis of spondylolisthesis was equal in each group. In patients who underwent surgery due to the diagnosis on statistically significant difference in both groups. 14 of the 22 patients in the second group were taken to surgery with 3-day blood pressure monitoring and analgesic treatment. Cardiology opinion was obtained for 8 patients due to arterial blood pressure and the patient management in the first group was applied.

Table 1

	1. Group	2. Group
Male	7	9
Female	14	13
Average age (year)	52,3	53,1
BMI (Kg/ m2)	28	27
Stabilized at 3 levels or less	9	12
Stabilized above 3 levels	14	8
Spondylolisthesis	6	6
Spondylolisthesis	17	14

The list of patients followed up due to hypertension is as in the table.

**Result**: We recommend that patients be taken to surgery again with blood pressure monitoring and effective analgesic treatment in order to reduce their exposure to long-term antihypertensive treatment.

Keywords: Hypertension, spinal stenosis, lomber disc hernia

# Ref No: 5025

### OUR SURGICAL OUTCOMES IN PATIENTS OPERATED FOR CHORDOMA

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**Aim**: This study aims to report the outcomes, complication rates, and recurrence rates of patients operated on for spinal chordoma.

**Material and Method**: A total of six patients were included in the study. One patient had recurrent cervical C2 chordoma, one had L4 vertebral chordoma, and four had sacral chordoma. The average follow-up period was three years (range: 1–5 years). The C2 cervical chordoma patient had a tumor extending into both foramina and involving the vertebral artery, with two previous surgeries. This patient underwent wide resection, while en bloc resection was performed in the remaining five patients.

**Findings**: At the one-year follow-up, no recurrence was detected in the C2 cervical chordoma patient, but at the four-year followup, one of the sacral chordoma patients had a recurrence. No recurrence was observed in the other patients during the average three-year follow-up period. One patient with sacral chordoma developed a superficial infection, while another developed a deep infection.

**Result**: While one sacral chordoma patient experienced recurrence at the four-year follow-up, the majority remained recurrence-free. Postoperative infections were observed in some cases, emphasizing the importance of vigilant surgical and postoperative care.

Keywords: chordoma, recurrence, infection, en bloc resection

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# **Ref No: 5065**

### COMPARISON OF ADJACENT SEGMENT DEGENERATION IN PATIENTS USING CERVICAL CAGE AND DISC PROSTHESIS IN ANTERIOR CERVICAL SURGERY

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**Aim**: To examine the prevalence of adjacent segment degeneration associated with the use of cages and disc prostheses in patients who underwent cervical disc surgery via an anterior cervical approach

**Material and Method**: We retrospectively reviewed the medical records of 60 patients who underwent cervical disc surgery via an anterior cervical approach at our clinic between 2018 and 2023. The patients were divided into two groups based on the type of implant used: those with a cervical cage (Group 1) and those with a cervical disc prosthesis (Group 2). Patients' demographic and clinical details, including age, gender, smoking habits, follow-up durations, and any additional comorbid diseases, were recorded. Radiological evaluations focused on degeneration rates in the segments adjacent to where either the cage or disc prosthesis was implanted

A) Preparation and placement of the cervical cage site. B) Preparation and placement of the cervical disc prosthesis. C)X-ray of the cervical spine after cervical disc prosthesis placement.



**Findings**: In the quest to address cervical spine degenerative conditions, both cervical cages and disc prostheses present unique advantages and challenges. While our research found no substantial difference in the overall incidence of adjacent segment degeneration between the two procedures, the location of this degeneration did vary. Cervical cages showed a predisposition towards proximal degeneration, whereas disc prostheses were linked with distal degeneration. This finding might hold clinical significance for future surgical planning and

post-operative patient care. Nevertheless, further large-scale and long-term studies are essential to draw comprehensive conclusions regarding the optimal surgical intervention for cervical disc ailments

**Result**: in the study comparing two groups, participants' average ages were 48.9 in Group 1 and 48.1 in Group 2 (p=0.720). Group 1 had a higher proportion of smokers (p=0.052) and more discopathy (p=0.196). In terms of disc degenerations, variations existed but were not statistically significant (p=0.259). Utilizing the Pfirrmann grading, Group 1 had more Grade III degeneration (p=0.088) and a significantly higher presence of ossification or osteophytes (p=0.038). Both groups showed high rates of adjacent segment degeneration, yet Group 1 had notably more proximal degeneration (p=0.012). Stenosis and facet hypertrophy differences were not significant (p=0.417, p=0.071). Follow-up duration averaged around 38 months for both groups (p=0.929).

**Keywords**: Cervical degenerative disc disease, adjacent segment disease, cervical cage, cervical disc prosthesis

# Ref No: 5101

# EARLY RESULTS OF UNILATERAL BIPORTAL DECOMPRESSION IN PATIENTS WITH LUMBAR SPINAL STENOSIS

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**Aim**: We aimed to demonstrate the early clinical results of unilateral biportal endoscopic bilateral decompression in cases with degenerative lumbar spinal stenosis in elderly patients.

**Material and Method**: Twenty-two patients who underwent unilateral biportal endoscopic bilateral decompression due to lumbar stenosis between 2022-2023 were retrospectively reviewed. Patients with a history of previous lumbar surgery, less than one year of follow-up, instability, tumor-related stenosis, and instrumentation or interbody fusion were excluded from the study. Patients' age, gender, lumbar stenosis level, preoperative complaint duration, mobility time, preoperative and

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postoperative Oswestry Disability Scale, hospital stay, follow-up duration, retinal hemorrhage, dural injury, re-operation, and infection status were examined.

Findings: Twenty-two patients (5 males, 17 females; mean age 63 years; range 52 to 77 years) who underwent unilateral biportal endoscopic bilateral decompression for degenerative lumbar stenosis were retrospectively analyzed. The mean duration of preoperative complaints was 20 months (range 8 to 48 months). Stenosis was observed at two levels in five patients and at a single level in 17 patients. The most common level of stenosis was L4-L5. Single-level stenosis was observed at the L3-L4 level in one patient, at the L4-L5 level in 12 patients, at the L5-S1 level in four patients, while double-level stenosis was observed at the L3-L4/L4-5 levels in one patient and at the L4-L5/L5-S1 levels in four patients. Discectomy was performed in addition to decompression in six patients. The mean operation time was 150 minutes (range 50-240 minutes), and the followup period was 1.3 years (range 1-2 years). The patients were mobilized and walked for an average of 6 hours (range 4-16 hours) after the operation. The mean Oswestry Disability score, which was 72% preoperatively, was observed to decrease to 28.5% postoperatively (p<0.001). No retinal hemorrhage or infection developed in any patient. Although radicular symptoms regressed during follow-up of one patient, instrumentation was performed approximately 6 months later due to accompanying back pain. Dural injury occurred during the operation in two patients. Endoscopic dura repair was also performed in two patients. The patients had severe headaches during the first week, which limited their mobilization. All patients except these patients were discharged 1 day later. No leakage was observed from the wound site in any of them. Although pseudomeningocele developed in one patient with dural effusion, there were no clinical complaints during follow-up.

### decompressed dura



**Result**: Unilateral biportal endoscopic bilateral decompression is an effective and safe method in elderly patients with spinal canal stenosis.

**Keywords**: spinal stenosis, degenerative, endoscopic discectomy, biportal, narrow canal

**Author Note**: Endoscopic spine surgery has become more frequently performed in recent years due to its advantages such as being minimally invasive, causing less postoperative pain, providing early mobilization, and increasing patient comfort, as well as less bleeding. We also wanted to report our own results. Best regards

# Ref No: 5106

### THE IMPACT OF SPINAL ALIGNMENT INDIVIDUALIZATION ON MUSCULOSKELETAL LOADS PREDICTIONS IN ADULT SPINAL DEFORMITY

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**Aim**: Spinal alignment is a critical biomechanical factor influencing the risk of mechanical complication after



spine surgery. While it significantly impacts spinal loads, musculoskeletal models often simplify body posture by evenly distributing postural angles across segments, leading to inaccuracies in alignment representations. This study aims to evaluate the effect of spinal alignment modeling methods, with increasing levels of individualization, on spinal load predictions in patients with adult spinal deformity.

Material and Method: Thoracolumbar spinal loads of 598 adult spinal deformity patients (52.6±21.0 years, M/F: 0.23) were predicted using a novel articulated musculoskeletal model of the spine (AnyBody v.8). For each patient, four uprightstanding models were reconstructed with progressively detailed sagittal (S1-S3) and sagittal-coronal (SC3) alignment representations derived from (bi-) planar radiographs (Figure 1). S1 used clinical measurement angles, S2 incorporated individual vertebral inclinations, and S3 added vertebral centroid positions. SC3 further included the coronal deformity. Spinal loads in compression (CMP), antero-posterior (AP), and mediolateral (ML) shear were estimated by inverse-static simulations. The relative force variation (RFV), calculated as the median % difference in loads across all spinal levels, was evaluated with respect to S3. Reconstruction errors in vertebral rotations and positions were analyzed.

Figure 1: Patient-specific spinal alignment modeling methods with increasing level of radiographical conformity.



**Findings**: Statistical differences (p<.05) were found in 125/153 evaluated segmental loads (CMP, AP, and ML shear) across all scenarios (Figure 2). Median RFVs in CMP compared to S3 were 10.64% (S1), and 15.06% (S2) higher in the sagittal plane and 45.88% (SC3) in the biplanar posture representations. For AP shear loads, higher median RFVs were observed: 41.45% (S1), 63.26% (S2) in the sagittal plane, and 36.57% (SC3) for coronal deformities. Vertebral inclinations related to S1 postures deviated by ±20° across all spinal levels, while centroid positions varied  $\pm$ 6cm (AP), -13cm to 7cm (cranial-caudal), and -17cm to 12cm (ML), compared to radiographic data. The findings

of this study demonstrate that the level of individualization in patient-specific alignment modeling significantly influences spinal load predictions. Simplified alignment reconstructions (S1-S3) resulted in substantial spatial deviations in vertebral positions and inclinations compared to the radiographic ground truth data, which may explain the observed discrepancies in load predictions. Additionally, spinal loads were significantly underestimated when coronal deformities were not incorporated into the model.

Figure 2: Body weight (BW) normalized T10-T11 CMP (left) and AP shear (right) in progressively biofidelic postures, analyzed with non- parametric (Shapiro-Wilk p<.0001), paired Friedman test.



**Result**: The level of individualization in posture reconstruction significantly impacts spinal load predictions. Therefore, it is crucial to fully incorporate radiographic information to accurately represent patient-specific vertebral alignment and ensure more reliable spinal load predictions.

**Keywords**: Adult Spinal Deformity, Mechanical complication, Spinal alignment, Spinal load predictions, Musculoskeletal Modeling

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# **Ref No: 5189**

### WHAT IS THE ROLE OF LUMBAR PARASPINAL MUSCLES IN ETIOLOGY OF ADULT DEGENERATIVE SCOLIOSIS?

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**Aim**: Extended human life will bring the problems of aging if preventive measures are missed. Only a few studies analyzed the association of paraspinal muscles in the pathogenesis of ADS. In the present study, we aimed to elaborate the recent advances in ADS and paraspinal muscles via a systematic review of the literature. We also aimed to analyze age-, and gendermatched subjects with and without ADS in terms of fatty infiltration of their lumbar paraspinal muscles.

**Material and Method**: We included 60 patients with ADS and age- and gender-matched 60 healthy control subjects without ADS. All subjects were evaluated in terms fatty infiltration in multifidus, erector spinae, and psoas muscles at all lumbar levels on lumbar spine MRIs. Studies regarding the role of paraspinal muscles in pathophysiology of ADS were retrieved from Pubmed/MEDLINE using PRISMA guideline.

**Findings**: Coronal Cobb angles were significantly greater in ADS patients. Patients with ADS had significantly fattier multifidus, erector spinae, psoas both on the concave and convex sides of the curve compared to the age- and gender-matched control subjects, except for the multifidus muscle on the convex side. Regression analysis revealed that the multifidus and psoas on the concave side were significant predictors for ADS compared to those on the convex side.

Figure 1



A 62 y-o, f, with low back pain and left leg pain for 10 years, more

severe for the last 2 years. She had no benefit from medication and physical therapy.

**Result**: Paraspinal muscles were fattier in patients with ADS compared to the controls. Fatty infiltration in the concave-sided psoas (2.3 times) and the multifidus (2 times) were significant predictors for ADS. Prospective clinical and experimental studies are required to reveal the exact role of multifidus and psoas muscle in triggering ADS and its progression.

**Keywords**: scoliosis, paraspinal muscles, back muscles, spine, lumbar vertebrae

# Ref No: 5226

### THE EVALUATION OF SPINOPELVIC BASE IN DEGENERATIVE LUMBAR SCOLIOSIS

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**Aim**: In the aging spine, degenerative lumbar scoliosis decreases the health-related quality of life and is frequently associated with spinal stenosis, segmental instability and coronal malalignment. It may arise de novo due to asymmetric degeneration or a sequel of an adolescent scoliosis. Moreover, pelvic obliquity may also predispose degenerative scoliosis. In this clinical study, we investigate the association between the pelvic asymmetry and lumbar degenerative scoliosis.

**Material and Method**: Patients who admitted to our outpatient clinics with a complaint of back pain, standing and walking difficulty and degenerative lumbar scoliosis was detected were included in this study. All the patients were evaluated via lumbar MRI, lumbar CT and standing AP/lateral scoliosis X-rays. Orthoroentgenograms were obtained for the evaluation of leg-length discrepancy. In the scoliosis X-ray; lumbar lordosis angle, lumbar coronal Cobb angle, pelvic obliquity (the angle between the intercristal line and a horizontal line), L4-tilt (the angle between L4 upper end plate and a horizontal line) were recorded. The coronal malalignment was categorized as type 1 or 2 according to the Obeid classification.

Findings: 36 patients were included and the average age was

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64.9 (range:56-78). The female/male ratio was 28/8. The Cobb angle of the coronal deformity was in average 19.430. Lumbar lordosis was 8.210 and had a statistically significant correlation with the coronal Cobb angle (p<0.05). Coronal malalignment was detected in 8(22.2%) patients. 6 of them were type 1, 2 of them were type 2 CM. Pelvic obliquity was 4.61, L4 tilt was 9.93. There was a statistically significant correlation between L4 tilt and coronal Cobb angle (p<0.05). There was hip prosthesis in 3(8.3%), unilateral hip pathology in 1(2.8%) and leg-length discrepancy in 3(8.3%) patients. The pelvic obliquity and L4 tilt were higher in these patients.

**Result**: Pelvis has a fundamental role in constituting the base for the spine and an asymmetry in the base may cause deformity in the upper segments. The evaluation of the spinopelvic base prior to surgery in degenerative lumbar scoliosis and planning the surgery accordingly, effets the outcomes of the surgery. Leglength discrepancy, hip problems, sacral inclination should be investigated in degenerative lumbar scoliosis and considered in the management strategy.

**Keywords**: degenerative scoliosis, pelvic obliquity, leg-length discrepancy, lumbosacral curve

# Ref No: 5305

# INFLUENCE OF SPINOPELVIC PARAMETERS ON LUMBAR DISC DEGENERATION AT L4–L5 AND L5–S1: EMPHASIS ON THE SACRAL TABLE ANGLE (STA)

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**Aim**: Pelvic morphology plays a pivotal role in determining sagittal spinal balance, with the sacrum serving as a structural cornerstone. Among spinopelvic parameters, sacral slope and sacral inclination are classified as positional parameters, while pelvic incidence and sacral table angle (STA) are considered fixed anatomical parameters intrinsic to sacral morphology. This study aims to evaluate the relationship between these sacral parameters and lumbar intervertebral disc degeneration at the L4–5 and L5–S1 levels.

**Material and Method**: This retrospective study included patients who presented with chronic low back pain and had both lateral lumbar X-rays and lumbar MRI. Patients with prior spinal surgery, vertebral fractures, congenital anomalies, or inflammatory spinal disease were excluded. On lateral radiographs; sacral table angle(STA), pelvic incidence (PI), sacral slope (SS), pelvic tilt (PT), lumbar lordosis (LL; L1–S1), segmental lordosis: upper (L1–L4) and lower (L4–S1) arcs, lordosis distribution index (LDI): (L4–S1 lordosis / L1–S1 lordosis) × 100 were measured. Degenerative disc grading of L4–5 and L5–S1 intervertebral discs was performed on MRI using the Pfirrmann classification system(grades 1–5). Grades 1–2 were categorized as non-degenerative, and grades 3–5 as degenerative. The results were analyzed statistically.

**Findings**: 90 patients (age: 47.3±11.2; 54 females,36 males) were included. Pfirrmann grade3–5 disc degeneration was observed in 61.1% of patients at L4–5 and 68.9% at L5–S1 levels.Patients with Pfirrmann  $\ge$ 3 had significantly lower STA compared to non-degenerative patients at both levels(p=0.001). LDI was significantly reduced in the degenerative group (p=0.002). A positive correlation was found between PI and disc degeneration severity (p=0.03), STA showed a stronger negative correlation (p<0.001). LOW were also moderately associated with higher Pfirrmann grades (p=0.002).

**Result**: This study demonstrates a significant association between sacral morphology and intervertebral disc degeneration particularly at the L4–5 and L5–S1 levels. Among the analyzed spinopelvic parameters, STA was the strongest predictor of disc degeneration suggesting a biomechanical disadvantage related to sacral endplate orientation and load distribution. Additionally, a reduced LDI was correlated with increased degeneration, indicating that a disproportionate accumulation of lordosis in the lower segments may increase mechanical stress on the lumbosacral junction. PI has a statistically insignificant positive correlation with degeneration Lower sacral table angle and decreased LDI are significantly associated with disc degeneration at L4–S1 levels in a non-operative population. Evaluation of sacral morphology, especially STA, may serve as a predictive tool for identifying individuals at risk for lumbar disc degeneration.

**Keywords**: disc degeneration, sacral morphology, sacral table angle, lordosis distribution index

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# Ref No: 5351

# COMPARISON OF CLINICAL AND RADIOLOGICAL OUTCOMES OF PATIENTS TREATED WITH KYPHOPLASTY FOR VERTEBRAL FRACTURES DUE TO MULTIPLE MYELOMA AND OSTEOPOROSIS

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**Aim**: The objective is to assess the relationship between radiological and clinical parameters during percutaneous balloon kyphoplasty procedures, while also examining the causes of unexpected excessive intraoperative bleeding in patients with active multiple myeloma lesions.

Material and Method: Patients who underwent percutaneous balloon kyphoplasty (PBK) between 2021 and 2024 at a single center, performed by a single surgeon, were analyzed cross-sectionally. The study included patients with vertebral compression fractures (VCFs) resulting from osteoporosis (OP) and multiple myeloma (MM). Exclusion criteria comprised patients with follow-up periods shorter than 12 months or those who had additional instrumentation. Both preoperative and postoperative radiological parameters, including anterior vertebral height (AVH), mid-sagittal vertebral height (MVH), and local kyphosis angle (LKA), were assessed alongside clinical parameters such as the Visual Analog Scale (VAS) and the Oswestry Disability Index (ODI). Additionally, intraoperative bleeding and cement leakage were evaluated. Patients were categorized into MM/OP groups and further divided into Thoracic (T), Thoracolumbar junction (TL), and Lumbar (L) groups. Statistical analyses were conducted using Student's t-test, Mann-Whitney U test, ANOVA, and Kruskal-Wallis tests.

Measurement of vertebral parameters



Measurement of mid-sagittal vertebral parameters.(yellow lines) a1,b1. Preoperative mid-sagittal vertebral height(MVHpreop), a2,b2. Postoperative mid-sagittal vertebral height(MVHpostop) Mid-sagittal Vertebral Height Restoration(MVHR): [(a2-a1)/ a1]×100 Measurement of anterior vertebral parameters(blue lines) c1,d1. Preoperative anterior vertebral height(AVHpreop) c2, d2. Postoperative anterior vertebral height (AVHpostop) Anterior Vertebral Height Restoration(AVHR): [(c2-c1)/ c1]×100 Measurement of local kyphosis angle(red lines) x1,y1: Preoperative local kyphosis angle(LKpreop) x2,y2: Postoperative local kyphosis angle (LKpostop) Local Kyphosis Angle Restoration(LKR): [(x1-x2)/x1]×100

**Findings**: A total of 40 patients and 51 treated levels with PBK were included in the study, which comprised 203 patients in total. The mean follow-up duration was 17.2 months. No significant correlation was identified between radiological and clinical outcomes, with the exception of a mild correlation observed between LKA correction and VAS/ODI scores. Among the MM patients, four cases experienced unexpected intraoperative bleeding exceeding 100 cc (specifically 100, 200, 250, and 500 cc). Cement leakage occurred in 10 levels (19.6%), with one instance of minor canal intrusion that did not result in neurological deficits. A retrospective analysis of PET/CT scans in patients with high bleeding volumes indicated that their lesions were in the active phases of multiple myeloma.

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### PET/CT images





In the PET/CT, lesions in the active phase are observed on the left, while lesions in the inactive phase are observed on the right.

Clinical and radiological parameters based on fracture cause

	MM		OP		TOTAL		
Mean(ss)	(n:20)		(n:20)	(n:20)		(n:40)	
	Preop	Postop	Preop	Postop	Preop	Postop	
AVH (mm)	21,2±5,9	23,7±5,5	22±7,3	24,1±6,3	21,6±6,5	23,9±5,9	
AVHR(%)		11,8±7,1		9,1±8,7		10,5±8,2	
MVH (mm)	19,7±4,5	23,1±4,7	20,6±6	23,2±5,2	20,1±5,2	23,1±4,9	
MVHR(%)		16,9±7,8*		12,6±10,9*		14,8±9,5	
LK (°)	9,2±7,2	5,9±4,8	10,6±6,9	6,5±5,7	9,9±7	6,2±5,9	
LKR(%)		36±26,1		38,7±36,8		37,4±32,3	
VAS	7,8±1	2,3±0,8	7,5±1	1,7±0,7	7,6±1	2±0,8	
ODI	66,2±13,4	33,6±8,9	64,4±16,2	26,1±9,6	65,3±15,1	29,8±9,9	

MM: Multipl Myeloma, OP: Osteoporosis , AVH(R): Anterior Vertebral Height (Restoration), MVH(R): Middle Vertebral Height (Restoration), LK(R): Local Kyphosis Angle (Restoration), VAS: Visual Analog Scale, ODI: Oswestry Disability Index, mm: milimeter, \*: p:0,043

Radiological parameters and VAS-ODI scores by levels.

Mean±ss	L		TL		Т	
(minmax)	(n:19)		(r	(n:30)		:2)
	Preop	Postop	Preop	Postop	Preop	Postop
AVH (mm)	26±4,3	27,8±3,8	19,8±5,7	22,3±5	7,2±2,4	10±2,3
AVHR(%)		7,6(0-28)		15,7(0-63)		41,3±16
MVH (mm)	22,9±4,2	25,5±3,7	19,2±4,5	22,5±4	8,1±2,4	9,9±1,4
MVHR (%)		13,1(0-71)		20±15,7		25,6±18,9
LK (°)	4,9±3,8	2,1(0,2-9,4)	12,5±7	8,3±6,2	17,4±2,4	12,2±0,4
LKR (%)		49,8±32,8		33,8±21,6		28,7±12,6
VAS	7,5±1	2±0,68	7,3±1,8	1,9±1	7,5±2,1	1,4±1
ODI	60,7±18,4	29,2±11,3	67,4±12,9	30,4±9,3	72±12,7	27,5±12

L: Lumbar, TL: Thoracolumbar Junction, T: Thoracal, AVH(R): Anterior Vertebral Height (Restoration), MVH(R): Mid-sagittal Vertebral Height (Restoration), LK(R): Local Kyphosis Angle(Restoration), VAS: Visual Analog Scale, ODI: Oswestry Disability Index, mm: milimeter, \*: p<0,05

Correlation tests between radiological and clinical parameters.

Correlation tests	VASdifference	ODIdifference
AVHR	p:0,293, r:0,170	p:0,077, r:0,283
MVHR	P:0,383, r:0,142	p:0,421, r:0,131
LKR	p:0,018, r:0,372*	p:0,034,r:0,335*

\*: low to moderate correlation

**Result**: No significant correlation was identified between radiological and clinical outcomes, with the exception of a mild correlation observed between LKA correction and VAS/ODI scores. Active multiple myeloma cases may lead to unexpected bleeding that exceeds 100 cc. Therefore, preoperative PET/ CT evaluation and precautionary measures should be taken into account when performing PBK on patients with multiple myeloma who had active lesions.

**Keywords**: Kyphoplasty, Osteoporosis, Multiple Myeloma, Compression fractures

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# **Ref No: 5446**

# A CLINICAL AND DEMOGRAPHIC INVESTIGATION ON CASES WITH MULTIPLE PTERYGIUM SYNDROME-ESCOBAR TYPE

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**Aim**: Multiple pterygium syndrome-Escobar type is a congenital anomaly mostly characterized by the presence of webbing of the skin in major joints but includes a series of other anomalies including vertebral dysmorphisms that need surgical correction. This study aims to investigate the demographic features and the clinical findings of patients with multiple pterygium syndrome-Escobar type.

**Material and Method**: 9 patients with MPS were characterized with the demographic features and the clinical findings as well as the treatments applied and the outcomes, and the findings were discussed in light of the current knowledge. Detailed comparison of 9 MPS patients with different family backgrounds were hence aimed in this study.

Images of the patients with MPS-Escobar syndrome.



Before and after the surgical interventions for vertebral corrections were shown for patients 2, 4, 5, and 6

Findings: In a systematic view, dysmorphisms observed in

the patients were named and listed for comparison besides other medical conditions they had. Surgical interventions and the results were indicated and discussed in light of the current knowledge.

Surgical interventions

(-): no, (+): yes, M:male, F:female

**Result**: As a result of the vertebral surgical interventions performed in the current study for scoliosis, a mean 65% correction was provided. We did not observe any major complications following surgical treatments in the current patients.

**Keywords**: Multiple pterygium syndrome, scoliosis, Escobar type

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# **Ref No: 5484**

# THE HISTORY OF ORTHOTICS AND PROSTHETICS IN THE 19TH CENTURY OTTOMAN EMPIRE

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**Aim**: Orthotics and prosthtics have important impact on the healths in spinal disorders. This study aims to explore the emergence and development of modern prosthetic manufacturing in the late 19th-century Ottoman Empire, particularly during the reign of Sultan Abdülhamid II (1876–1909), and early 20th century.

**Material and Method**: The research is based on qualitative analysis of primary sources from the Ottoman Archives, and neurosurgery and orthaedic history books.

**Findings**: The findings reveal that the Ottoman state, under Abdülhamid II, established prosthetic workshops in key militaryindustrial institutions such as the Imperial Arsenal (Tersane-i Amire) and the State Gun Factory (Tophane-i Amire). Skilled s were staffs sent to Paris to be trained by renowned manufacturers like Raoul Mathieu. Additionally, private entrepreneurs such as Hugo Avellis played a notable role in prosthetic production, often commissioned by the palace. More than 90 individuals formally requested prosthetic limbs—mostly legs—through state channels, with a high proportion receiving state funding. Establishment of first orthessis center, Tersane-i Alatı Nazikiye, in Gülhane Hospital, contributed to the results of surgeries.

**Result**: The study concludes that modern prosthetic production in the Ottoman Empire was not only a technological advancement but also a manifestation of a broader transformation in governance.

Keywords: History, Orthotics, Ottoman Empire, Prosthetics

# **Ref No: 5538**

# WHO IS MORE SUCCESSFUL IN A SPINAL SURGERY EXAMINATION? CHATGPT-3.5/4.0 OR RESIDENT DOCTOR?

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**Aim**: As in all work sectors, Artificial Intelligence (AI) is now often used and has increased especially in the field of medicine with advances in technology. The aim of this study was to compare Chat GPT-4.0, ChatGPT3.5 and orthopedics and traumatology residents on the national board exam spine questions.

**Material and Method**: In Orthopedics and Traumatology Clinic of a 3rd level university hospital, an exam consisting of only spine questions was held with the participation of 15 residents. The same questions were asked to ChatGPT-3.5 and ChatGPT-4.0 on two different days. The exam consisted of true/false questions, theoretical/classical and diagram/visual sections. Each section was evaluated out of 100 points and the average score was calculated. The results were evaluated by two different instructors.

**Findings**: The mean score obtained was 72.88 for ChatGPT-3.5 (p=0.005) and 69.38 for Chat GPT-4.0 (p=0.001), showing a 5.87% difference in success. The mean score obtained was 69.90 for orthopedic resident (p=0,779). Both the 3.5 and 4.0 versions of ChatGPT AI were observed to have a knowledge level equivalent to that of a 3rd year resident.

**Result**: 4th and 5th year Orthopedic residents were able to answer more questions correctly than ChatGPT-3.5 and GPT-4 on the TOTEK spine assessment questions. Both ChatGPT-3.5 and GPT-4 performed better on text-only questions than on visual questions. It is unlikely that GPT-4 or ChatGPT-3.5 will pass the Turkish Board of Orthopedics and Spine Questions written examination.

**Keywords**: ChatGPT, artificial intelligence, spine questions, ChatGPT-4.0

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# **Ref No: 5605**

### INTERVENTIONAL PAIN MANAGEMENT IN PATIENTS WITH ACUTE LOW BACK PAIN DUE TO LUMBAR DISC HERNIATION

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**Aim**: Acute pain caused by lumbar disc herniation (LDH) poses significant challenges for clinicians in terms of both patient's quality of life and treatment planning. In this study, patients presenting with acute LDH were treated by interventional pain management techniques and evaluated their follow-up.

Material and Method: Patients included in the study had acute LDH without neurological deficits; those with motor and/ or sensory loss, cauda equina syndrome, trauma, tumors, or infections and radiofrequency ablation cases were excluded.A total of 37 patients with acute LDH were included. Patients with L5-S1 level herniation and multilevel LDH involving this level underwent caudal epidural block and medial branch blocks at the relevant levels and sides (Group A-caudal block).For patients with LDH at L4-5 and higher levels, transforaminal nerve root block on the affected side and medial branch blocks at the adjacent levels were performed (Group B-transforaminal block).All procedures were performed in operating theatre, using ultrasonography guidance and fluoroscopic confirmation. Combination of depot-steroids and bupivacaine were used for transforaminal and caudal blocks and only bupivacaine was used for medial branch block. Visual Analog Scale (VAS) scores were recorded preoperatively, in the early postoperative period, at 1 month, and at 6-month follow-up.

**Findings**: Of the 37 patients who underwent the procedure, 15 were male, with a mean age of 58.8 years. The distribution of herniation was as follows: 11 at L5-S1, 13 at L4-5, 6 at L3-4, 1 at L2-3, and 6 with multilevel LDH. Sixteen patients with LDH involving L5-S1 were treated in Group A, and 21 patients with LDH at L4-5 and above were treated in GroupB. One patient from Group A and two from Group B eventually required microdiscectomy due to persistent pain. Pre-procedure VAS scores were 7.81 in Group A and 7.89 in Group B. Early postoperative scores were 2.86 in Group A and 3.11 in Group B.At the 1-month follow-up, scores were 4.81 for Group A and 4.88 for Group B.A

significant reduction in VAS scores was observed at all followup points compared to pre-procedure values (p<0.05). Although pain control was slightly better in the caudal block group, the difference was not statistically significant.

**Result**: Interventional pain procedures can provide effective pain relief in patients with LDH. The efficacy of the caudal epidural block may be attributed to the higher volume of medication administered and the potential for drug delivery to the anterior epidural space. However, it did not demonstrate a statistically significant advantage over the transforaminal block.

### tablo 1

Time Point	VAS Score – Group A	VAS Score – Group B
Pre-procedure	7.81	7.89
Early Post-op	2.86	3.11
1 Month Fol- Iow-up	3.98	4.04
6 Month Fol- Iow-up	4.81	4.88

Results of VAS scores were showed at the follow-up

**Keywords**: lumbar disc herniation, back pain, interventional pain management

# **Ref No: 5649**

### SHEEP CADAVER MODEL FOR UNILATERAL BIPORTAL ENDOSCOPIC LUMBAR DISCECTOMY TRAINING: ENHANCING TECHNICAL PROFICIENCY

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**Aim**: To evaluate the feasibility of using sheep cadavers for training in unilateral biportal endoscopic lumbar discectomy and to develop a video-based training model for surgical education.

**Material and Method**: Five sheep cadavers were utilized in this study to simulate surgical conditions. An experienced surgeon supervised the dissections conducted by five junior surgeons.

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Key parameters were meticulously analyzed, including entry points, procedural time, and subjective technical challenges reported during the procedures. The time for triangulation and hemilaminectomy, flavectomy, and discectomy were recorded for each surgeon.

**Findings**: The UBE was successfully completed in all five cadavers without major technical complications. All components of the surgical protocol, including laminectomy, ligamentum flavum resection, and discectomy, were executed effectively using the designated instruments. Interlaminar endoscopic visualization of anatomical structures, including the ligamentum flavum, dural sac, and nerve root, was clear in all models. Five surgeons with no prior experience in UBE performed procedures at the L2-3, L3-4, and L4-5 levels. The overall average times for all surgeons combined were 13 minutes and 51 seconds for triangulation and hemilaminectomy, 7 minutes and 1 second for flavectomy, and 3 minutes and 53 seconds for discectomy. Procedure times demonstrated a significant reduction as surgeons gained experience with the model.

**Result**: The increasing indications and established benefits of endoscopic lumbar surgery emphasize the need for effective and safe training methodologies. This study demonstrates the feasibility of using sheep cadavers as an experimental model for developing technical proficiency in the interlaminar approach to endoscopy. Animal cadavers represent a practical alternative to human cadavers, reducing reliance on patient-based learning. Incorporating such models into training curricula has the potential to enhance surgical confidence, skill acquisition, and procedural efficiency, ultimately contributing to improved patient outcomes.

Figure 1



A,B Fluoroscopic guidance for port placement for biportal entry before triangulation. C,D Triangulation with dilators and subsequent fluoroscopic control.

Figure 2



A. Insertion of the trocar and 30-degree endoscope from the viewing portal, and insertion/removal of the surgical instrument from the working portal. B. Some surgical instruments used. C. Placement of the endovision tower.

Figure 3



Images from the endoscope during the procedure. A. Laminectomy and flavectomy stage. B. View of the thecal sac, root, and intervertebral disc after discectomy.

**Keywords**: UBE, Unilateral Biportal Endoscopic Lumbar Discectomy, Sheep Cadaver Model, Training

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# **Ref No: 5685**

# POSTOPERATIVE FAT NECROSIS IN A THIN SCOLIOSIS PATIENT

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**Aim**: Persistent wound discharge after adolescent scoliosis surgery is a rare complication. In this case, we will share our patient who had wound discharge that started 2 months after surgery and lasted 3 months.

**Material and Method**: A 14-year-old female patient was hospitalized with a diagnosis of Adolescent Idiopathic Scoliosis and an operation was planned. The patient underwent T3-L3 posterior fusion and a 60 cc synthetic graft was placed to accelerate the fusion and the operation was terminated. The patient, who did not develop any complications after the operation, was discharged.

**Findings**: Post-op 2nd month, the patient who developed discharge at the wound site underwent debridement surgery. The fibrinous materials taken from inside were sent to pathology. The synthetic bone grafts were cleaned and the operation was terminated. Post-op 4th week, the patient who developed discharge again underwent debridement once more from the area where there was local discharge. After debridement, the patient who developed discharge again underwent debridement debridement 2 more times and then the discharge stopped. The material taken from the patient and sent to pathology was compatible with fat necrosis.

**Result**: In very thin scoliosis patients, the possibility of fat necrosis should be kept in mind in cases of persistent postoperative discharge, and graft use, which may further increase discharge in the postoperative period, should not be preferred in these patients. In cases of retraction in patients, instead of major debridement, if pathology is taken from the discharge and fat necrosis occurs, complete healing of the wound is achieved by debridement of the areas with local discharge.

Keywords: scholiosis, fat necrosis, wound complication

# Ref No: 5695

# EXTRUDED LUMBAR DISC MIGRATION: REPORT OF MULTI-CENTER CASE SERIES AND LITERATURE REVIEW

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**Aim**: Lumbar disc herniation is one of the most frequently encountered conditions in neurosurgical practice. Disc herniations may remain contained within the annulus or, by completely rupturing the annulus, may extrude and exhibit migration. The aim of this study is to shed light on etiology by examining the factors that may lead to migration through a case series and a review of similar series in the literature.

**Material and Method**: Patient data for a total of 60 patients with "extruded lumbar disc migration" were retrospectively analyzed from three centers, with an equal number of male and female patients. The patients' ages and magnetic resonance (MR) images were evaluated to assess the lumbar disc level, degree and direction of migration, lumbar lordosis angle, side of the herniation, and axial location.

**Findings**: The mean age of the patients was  $47.25 \pm 12.67$  years, with an equal gender distribution. The most frequently observed disc levels were L4-5 (41.7%), L5-S1 (36.7%), L3-4 (18.3%), and L2-3 (3.3%). The migration grades were distributed as follows: Grade 2 (33.3%), Grade 1 (30.0%), Grade 3 (25.0%), and Grade 4 (11.7%). In terms of migration direction, 75% of cases exhibited caudal (downward) migration, while 25% exhibited cranial (upward) migration. The average lumbar lordosis angle was measured as 24.15  $\pm$  4.79 degrees. The lesions were most frequently observed on the left side (53.3%) and in the subarticular region (58.3%). No significant relationship was found between migration direction and the other evaluated parameters (p> 0.05).

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Number graph of migration directions per level



Number graph of migration directions per age group

**Result**: Lumbar discs exhibiting migration were more frequently found in the lower lumbar region compared to the upper lumbar region. The likelihood of caudal migration is higher than that of cranial migration. A review of the literature indicates that patients with extruded discs demonstrating migration tend to have a lower lumbar lordosis angle compared to the normal population. In all cases, the extruded disc fragments always demonstrated either craniolateral or caudolateral migration. The posterior longitudinal ligament was identified as an important anatomical barrier in preventing midline migration.

**Keywords**: disc herniation, extruded disc, cranial migration, caudal migration

# Ref No: 5718

# IMPACT OF FOUR-ROD INSTRUMENTATION AND INTERBODY CAGES ON PSEUDARTHROSIS AND ROD BREAKAGE IN ADULT SPINAL DEFORMITY SURGERY WITH PELVIC FIXATION AND SCHWAB TYPE 2 OSTEOTOMIES: A COMBINED FINITE ELEMENT MODEL AND CLINICAL DATA ANALYSIS

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SPINE

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**Aim**: Adult Spinal Deformity surgeries with pelvic fixation and Schwab type 2 osteotomies are associated with high rates of mechanical complications, particularly pseudarthrosis/ rod breakage, resulting in unplanned reinterventions and poor functional outcomes. While four-rods instrumentation and interbody cages have demonstrated biomechanical and clinical advantages, evidence supporting their role in reducing pseudarthrosis/rod breakage in these high-risk surgeries remains limited. This study aims to determine the impact of four-rods and interbody cages in pseudarthrosis/rod breakage and to correlate it with a biomechanical Finite Element Model (FEM).

**Material and Method**: A validated FEM simulated Schwab type 2 osteotomies at L4-L5 in 2-rod and 4-rod configurations, with or without interbody cages at L4-L5 and L5-S1. Rod strain and range of motion was calculated under a 7.5 Nm moment. Additionally, a retrospective analysis of prospective multicentric



adult spinal deformity data was performed on patients with pelvic fixation and Schwab type 2 osteotomies. A minimum of 2 years of follow-up was necessary, and patients were classified based on pseudarthrosis/rod breakage occurrence. Demographic, surgical, radiographic, and patient-reported outcome measures (PROMs) data were compared. Univariate and multivariate analyses identified protective factors for pseudarthrosis/rod breakage, focusing on 4-Rod constructs and interbody cages.

**Findings**: The Finite Element Model analysis revealed maximal rod strain of 399 MPa at the osteotomy site inflexion. 4-Rod constructs and interbody cages reduced strain to 116 MPa at L4-L5 and 80 MPa at L5-S1 (Figure). Among 213 patients, pseudarthrosis/rod breakage occurred in 61 (28.6%). Multivariate analysis identified the use of 4-Rods constructs (OR 0.331, 95% CI: 0.16–0.71, p=0.004) and interbody cages (OR 0.46, 95% CI: 0.23–0.94, p=0.033) as protective factors. Patients with pseudarthrosis/rod breakage experienced more unplanned reinterventions, worse functional outcomes, and greater sagittal alignment loss at 2 years postoperatively.



Figure: Von Mises stress (MPa) distribution according to instrumentation configurations and loading direction. IBC, Interbody Cage.

**Result**: Instrumentations with 4-Rod and interbody cages in adult spinal deformity surgeries with pelvic fixation and Schwab type 2 osteotomies significantly reduce rod strain and decrease the risk of pseudarthrosis/rod breakage, achieving better functional outcomes and reducing unplanned reinterventions and loss of alignment with time.

**Keywords**: Adult Spinal Deformity (ASD), Pseudarthrosis, Rod breakage, Four-rods (4R) instrumentation, Finite Element Model (FEM)

# **Ref No: 5747**

### RISK FACTORS INFLUENCING DISTAL PEDICLE SCREW LOOSENING IN DEGENERATIVE LUMBAR SCOLIOSIS: THE ROLE OF FUSION TERMINATION LEVEL AND DEGREE OF CORRECTION

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**Aim**: The aim of this study was to evaluate risk factors affecting distal pedicle screw loosening (DPSL) following posterior instrumented fusion surgery for degenerative lumbar scoliosis, and to determine the effect of fusion termination level (L5 or S1) on DPSL, thus providing data to guide clinical decision-making in surgical planning and treatment strategies.

**Material and Method**: This retrospective study was conducted as a two-center study involving patients who underwent posterior instrumented fusion surgery for degenerative lumbar scoliosis between 2016 and 2023. Patients were divided into three groups



based on the presence of DPSL and fusion termination levels: Group 1 (fusion ending at L5, n=26), Group 2 (fusion ending at S1, n=15), and Group 3 as control group without screw loosening (n=60). Gender distribution was similar across groups (66 female, 35 male). Parameters analyzed included patient age, gender, body mass index (BMI), comorbidities (hypertension, diabetes, coronary artery disease), duration of surgery, bone mineral density (BMD), presence or absence of fusion, fusion termination level, amount of Cobb angle correction, lumbosacral coronal angle (LSCA) correction, coronal balance distance (CBD), lumbar lordosis (LL), thoracolumbar junction angle (TL), pelvic incidence (PI), sacral slope (SS), and sagittal vertical axis (SVA).

**Findings**: Distal pedicle screw loosening occurred in 41 (40.6%) of 101 patients. Patients with DPSL had significantly lower BMD values (p<0.05). The absence of fusion was identified as a significant risk factor for DPSL (p<0.05). Correction of  $\geq$ 20 degrees in Cobb angle and  $\geq$ 12 degrees in LSCA were significantly associated with increased risk of DPSL (p<0.05). Although DPSL frequency was higher in patients with fusion termination at L5 and in female patients, these differences were not statistically significant (p>0.05). Additionally, age, gender, BMI, comorbidities, surgical duration, coronal balance distance (CBD), lumbar lordosis (LL), thoracolumbar junction angle (TL), pelvic incidence (PI), sacral slope (SS), and sagittal vertical axis (SVA) were not identified as significant risk factors for DPSL (p>0.05).

Comparison of Demographic and Clinical Characteristics of Patients by Groups

Parameters	Group 1 (L5, n=26)	Group 2 (S1, n=15)	Control (n=60)	p-value
Age (years,	64.2 ±	63.8 ±	65.1 ±	>0.05
mean ± SD)	7.1	7.4	6.9	
Gender (F/M, n)	17/9	10/5	39/21	>0.05
BMI (kg/m²,	27.4 ±	27.0 ±	26.8 ±	>0.05
mean ± SD)	3.8	3.5	3.9	
Hypertension,	12	7	29	>0.05
n (%)	(46.2%)	(46.7%)	(48.3%)	
Diabetes, n	7	4	16	>0.05
(%)	(26.9%)	(26.7%)	(26.7%)	
Coronary ar- tery disease, n (%)	5 (19.2%)	3 (20.0%)	12 (20.0%)	>0.05

Parameters	Group 1 (L5, n=26)	Group 2 (S1, n=15)	Control (n=60)	p-value
Operation duration (min, mean ± SD)	210.3 ± 45.2	215.5 ± 43.6	208.4 ± 46.7	>0.05
Bone Mineral Density (BMD, mean ± SD)	2.645 ± 0.08	2.670 ± 0.09	1.945 ± 0.10	<0.001

### Table 1

Comparison of DPSL Frequency, Fusion Status, and Number of Fusion Levels Among Groups

Parameters	Group 1 (L5, n=26)	Group 2 (S1, n=15)	Control (n=60)	p-va- lue
Fusion performed (Yes/No), n (%)	9/17	9/17	9/17	<0.05
Number of fused levels (mean ± SD)	7.2 ± 1.1	7.5 ± 1.2	6.8 ± 1.2	0.062

Table 2

Comparison of Radiological Parameters Among Groups

Parameters	Group 1 (L5, n=26)	Group 2 (S1, n=15)	Control (n=60)	p-value
Cobb angle cor- rection (°, mean ± SD)	24.8 ± 3.4	25.6 ± 3.7	15.4 ± 2.8	<0.05
LSCA correction (°, mean ± SD)	14.2 ± 3.1	14.7 ± 3.6	8.2 ± 3.1	<0.05
Coronal balance distance (CBD, mm)	20.3 ± 11.7	21.4 ± 12.1	19.6 ± 12.0	>0.05
Lumbar lordosis correction (LL, °)	14.8 ± 8.9	15.2 ± 8.4	15.7 ± 9.3	>0.05
Thoracolumbar junction angle correction (TL, °)	9.6 ± 5.4	10.1 ± 5.7	9.2 ± 5.1	>0.05
Pelvic incidence (PI, °)	48.4 ± 9.2	47.7 ± 9.5	48.1 ± 8.7	>0.05
Sacral slope (SS, °)	32.5 ± 6.4	33.2 ± 6.7	32.9 ± 6.6	>0.05

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Parameters	Group 1 (L5, n=26)	Group 2 (S1, n=15)	Control (n=60)	p-value
Sagittal vertical axis (SVA, mm)	45.4 ± 26.3	44.9 ± 25.9	44.2 ± 25.1	>0.05
Coronal balance correction (CBD, mm)	9.2 ± 5.6	8.8 ± 5.7	9.0 ± 5.4	>0.05

### Table 3

**Result**: Lower bone mineral density, absence of fusion, and greater corrections in Cobb angle and LSCA are significant risk factors for DPSL following degenerative lumbar scoliosis surgery. Fusion termination level (L5 or S1) and gender were not found to have a statistically significant impact on screw loosening. These findings may guide clinical decision-making in preoperative patient evaluation and surgical planning.

**Keywords**: Degenerative lumbar scoliosis, Distal pedicle screw loosening, Fusion termination level, Cobb angle

# Ref No: 5761

# THE RELATIONSHIP BETWEEN CHRONIC LOW BACK PAIN AND PSYCHOLOGICAL COMORBIDITIES: AN EVALUATION OF ANXIETY, DEPRESSION, AND SLEEP DISORDERS

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**Aim**: Low back pain (LBP) is a major global health issue affecting a significant portion of the adult population. While acute LBP often resolves spontaneously, a subset of cases progresses to chronic low back pain (CLBP), lasting over 12 weeks. CLBP is the second most frequently reported pain syndrome in individuals under 45, following headaches. Its association with productivity loss and treatment resistance necessitates a multidisciplinary approach. The estimated global prevalence of CLBP ranges from 9% to 21%, contributing to substantial economic and public health burdens. Psychological comorbidities, particularly depression and anxiety, are significantly more prevalent in CLBP patients than in the general population. This study aimed to evaluate the prevalence of anxiety, depression, and sleep disturbances in CLBP patients and analyze their relationship with pain severity and disability levels.

**Material and Method**: The study included 73 patients diagnosed with nonspecific CLBP in our neurosurgery outpatient clinic. Structural or infectious causes were ruled out through lumbar imaging and laboratory tests. Demographic data, socioeconomic status, medication use, and comorbidities were recorded. Psychological and pain assessments included the Patient Health Questionnaire-9 (PHQ-9) for depression, the Generalized Anxiety Disorder-7 (GAD-7) scale for anxiety, the Visual Analog Scale (VAS) for pain intensity, the Oswestry Disability Index (ODI) for functional impairment, the Insomnia Severity Index (ISI) for insomnia, and the Pittsburgh Sleep Quality Index (PSQI) for sleep quality.

Findings: The study comprised 34 (46.6%) males and 39 (53.4%) females, with a mean age of 42.78 ± 15.93 years. Frequent analgesic use was reported by 61.6% of patients, while 5.5% required sleep medication regularly. The mean ODI score was 32.1%, with 30% of patients experiencing severe disability. The mean VAS score was 6.2, and 35.6% of patients reported severe pain. Anxiety symptoms were absent in 17.8% of patients, whereas 20.5% exhibited severe anxiety. Moderate-tosevere depression was observed in 60.3% of patients. Insomnia was reported by 57.5% of patients, and 53.4% had poor sleep quality. Disability levels showed significant correlations with depression, anxiety, insomnia, and sleep quality but not with pain severity. Gender differences were not statistically significant in any assessed parameters. Alcohol and tobacco use were more common among males but did not correlate with psychological or pain-related variables.

**Result**: CLBP is strongly associated with psychological comorbidities, particularly depression, anxiety, and sleep disturbances. These factors significantly impact disability levels, underscoring the importance of a biopsychosocial approach in CLBP management.

**Keywords**: Chronic Low Back Pain, Psychological Comorbidities, Anxiety, Depression, Sleep Disorders

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# **Ref No: 5779**

# ASSOCIATION BETWEEN THE OPERATION DURATION, **BLOOD TRANSFUSION AND EARLY INFECTION IN** A SERIES OF 300 CASES OF THORACOLUMBAR **STABILIZATION**

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Aim: Thoracolumbar stabilization is a common surgery performed by neurosurgeons for conditions such as spinal deformity, degenerative spine diseases, spine fractures and tumors. The duration of surgery can be prolonged for various reasons and has been associated with several complications in the literature. In this study, we aim to retrospectively examine 300 cases of thoracolumbar stabilization performed at Ankara Bilkent City Hospital Neurosurgery Clinic between 2020 and 2024, focusing on the relationship between operation duration, blood transfusion and early postoperative infections.

Material and Method: We retrospectively analyzed 300 patients who underwent thoracolumbar stabilization at Ankara Bilkent City Hospital Neurosurgery Clinic between 2020 and 2024. We collected data on patients' demographics such as age and gender, as well as operation duration, whether perioperative or postoperative blood transfusion was administered, and the occurrence of early postoperative infections. The data were analyzed using logistic regression in SPSS.

Findings: Among the 300 patients, 95 were male and 205 were female, with an age range of 25-82 years (mean: 60, median: 62). The average operation duration was 5,07 hours (min: 3, max: 8, median: 5). Blood transfusions were administered to 111 patients (37%) and only 6 patients (2%) developed early postoperative infections. Logistic regression analysis found a significant relationship between operation duration and blood transfusion (p < 0.001). However, no significant relationship was found between operation duration and early postoperative infections (p = 0.193).

The Relationship Between Operation Duration and Blood Transfusion

**Omnibus Tests of Model Coefficients** 

		Chi-square	df	Sig.
	Step	25.765	1	<.001
Step 1	Block	25.765	1	<.001
	Model	25.765	1	<.001

The Sig. value in the "Model" row indicates whether the binary logistic regression analysis we conducted is statistically significant, meaning whether it provides a result. If it is less than 0.05, it is considered significant. We found p < 0.001.

Variables in the Equation

						95% C.I.for EXP(B)			
		В	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Step	operation duration	.579	.121	22.889	1	<.001	1.784	1.407	2.261
Id	Constant	-3.510	.641	29.933	1	<.001	.030		

Variable(s) entered on step 1: operation duration.

The Sig., or p-value, was found to be less than 0.001, indicating a statistically significant result.

The Relationship Between Operation Duration and Infection

		Chi-square	df	Sig.
Step 1	Step	1.697	1	.193
	Block	1.697	1	.193
	Model	1.697	1	.193

Omnibue Tasts of Model Coefficients

The Sig., or p-value, turned out to be greater than 0.001. Therefore, it is not statistically significant.

**Result:** Our study indicates that longer operation durations increase the likelihood of blood transfusion, which is undesirable due to potential complications. Therefore, the importance of monitoring operation durations is emphasized. Regarding the relationship between operation duration and early postoperative infection, no significant result was found, possibly due to the low number of infection cases (only 6) in our series. We believe that analyses of larger series could yield more meaningful results.

Keywords: Blood transfusion, spinal surgery, spinal fusion, thoracolumbar, operation duration, early infection

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# **Ref No: 5854**

# CONGENITAL MELANOCYTIC NEVUS AND HOLOCHORD PERIPHERAL NERVE SHEATH TUMOR: CASE REPORT

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**Aim**: The aim of this case report is to review the clinical features of holochord peripheral nerve sheath tumor after congenital melanocytic nevus and the challenges in the diagnosis and management of this rare combination. It also highlights the potential complications of congenital nevi, emphasizing how such rare cases can be managed with early detection and appropriate intervention.

Material and Method: A 2-year-old male patient who was being followed up in the pediatric hematology and oncology department with a diagnosis of congenital melanocytic nevus was consulted to our department because of respiratory distress and decreased movement in the lower extremities. Spinal MRI revealed an intradural mass in the holochord between C5-L1. Neurologic examination revealed paralyzed intercostal muscles. abdominal breathing and hypoactive lower extremities. The family was informed about the surgical procedure and signed consent was obtained. The laminae between L1 and C5 were incised by microsurgical method in order to suture them back to the intact bone. With the opening of the dura, the tumor was seen to cleave through the spinal cord. The tumor tissue was excised from the spinal cord and the level of T3 was reached. At this level, due to the high adhesion of the tumor to the surrounding tissue and the development of respiratory and cardiac depression in the patient's maneuvers for excision, the surgery was terminated by leaving the residue. In the 2-week postoperative follow-up period, it was observed that the patient's lower extremities increased movement and intercostal muscles participated in breathing, and respiratory stress disappeared accordingly.

T2-weighted sagittal MRI (Intadural lesion extending between C5-L1)  $\ensuremath{\mathsf{C5-L1}}\xspace$ 



Preop appearance of a patient with congenital melanocytic nevus



Intraoperative observation (A. Dissection of the tumor from the spinal cord, B. Tumor removal)



**Findings**: Congenital melanocytic nevi (CMN) are benign pigmented lesions present at birth, arising from melanocytes under the skin. They are typically identified in early childhood and vary in size. While mostly benign, CMN can occasionally undergo

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malignant transformation and cause systemic complications. A holochord peripheral nerve sheath tumor, a rare tumor originating from nerve sheath cells, can be benign or malignant. It forms around nerve roots and the spinal cord, often causing pain, neurological deficits, and functional loss. The combination of CMN and holochord peripheral nerve sheath tumor is rare and presents diagnostic and therapeutic challenges. This case describes respiratory distress, paraparesis, intraoperative complications, and the patient's postoperative clinical course.

**Result**: In this case report, we will review a case of holochord peripheral nerve sheath tumor after congenital melanocytic nevus and discuss the important findings in the literature regarding such a rare clinical presentation.

Keywords: Holochord, Congenital melanocytic nevi, Paraparasia

# Ref No: 5879

### PATIENTS WITH POTT'S DISEASE UNDERGOING EMERGENCY POSTERIOR DECOMPRESSION SURGERY AND OUR OUTCOMES

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**Aim**: The number of tuberculosis cases is rising in both developed and developing countries due to low socioeconomic status and migration. In TB, paravertebral cold abscess formation rate is high.Medical treatment is the gold standard for TB. Neurological decline and spinal instability is an urgent.

**Material and Method**: A total of 57 patients with Pott's disease who underwent emergency decompression and posterior stabilization for neurological deficits in neurosurgery clinic between 2017 and 2024 were followed up.Posterior laminectomy, stabilization, and bone fusion procedures were performed for 56 patients.One Patient underwent both anterior and posterior approach.. One patient underwent posterior corpectomy(Figure 1,2). 12 patients underwent abscess drainage. In all patients, the operation site was irrigated with rifampin, gentamicin, and vancomycin following the biopsy procedure, abscess drainage, posterior stabilization surgery . The preparations were sent to pathology and microbiology departments.

Figure 1



Figure 1- 25-year-old male patient's sagittal T2 W1 MRI scans shows collapse of lytic lumbar vertebrae.

### figure 2



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# Figure 2- Young patient's postoperative lateral X-ray

### figure 3



62-year-old man's preoperative sagittal CT scans shows Thoracic 10-11 lytic vertebraes.

**Findings**: 41 male and 16 female patients was followed up . Thoracic vertebral involvement was more frequent. 12 patients underwent abscess drainage. Seven of them relapsed. The patients' mean age was  $58,02 \pm 17,23$  years, white blood cell count was  $9215,96 \pm 3045,043$ mcL, C-reactive protein level was  $52,70 \pm 30,92$  mg/L. Preoperative Modified Frankel score Grade 1 (n:36), 2 (n:10), 3 (n:11). The mean preoperative visual analogue scale (VAS) score of the patients was  $8,40 \pm 0,49$ , while their postoperative pain score was  $2,84 \pm 0,75$ . The mean improvement in local kyphotic angle was  $5,75^{\circ} \pm 3,29^{\circ}$ .

### table 1

Level	Affected ver- tebrae (n:)	%	Next affected ver- tebrae (n:)	%
L5	11	19,3	-	-
L4	-	-	5	8.8
L3	5	8,8	-	-
T12	-	-	6	10,5
T11	6	10,5	12	21,1
T10	12	21,1	10	17,5
Т9	10	17,5	-	
T6	-		6	10,5
T5	6	10,5	6	10,5
T4	6	10,5	-	
C6	-		1	1,8
C5	1	1,8	-	
None	-		11	19,3

affected vertebrae levels, number

table 2

	Abscess(+)	Abscess(-)	p value
age	46.67±8.23	61.04± 17.79	0,009
wbc	8950± 731.12	9286±3412.18	0,73
crp	63.50±8.77	49.82±34.02	0,17
VAS	9.00±0.00	8.24±0.43	0,00
vas postope- rative	3.50±0.52	2.66±0.70	0,00
Frankel score	1,50±0,79	1,57±0,81	0,76

abcess (+), (-) groups

**Result**: Medical treatment is the gold standard for tuberculosis. Although the anterior approach is performed in large pott series, surgery can be performed safely with a posterior approach under the microscope view in emergency cases such as neurological deficit development and spine instability.

Keywords: Pott, spine, abscess, surgery

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# **Ref No: 5929**

# ADAPTATION OF ABDOMINAL WALL TO SPINAL DEFORMITY MIGHT COMPROMISE POSTOPERATIVE BIOMECHANICS AND CONTRIBUTE TO PJK -SIMULATION STUDY

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**Aim**: Proximal junctional kyphosis (PJK) is a common complication after fusion surgery for adult spinal deformity. Adaptation of tissues to sagittal deformity might cause abdominal wall shortening/stiffening. If the sagittal alignment restoration puts tension on abdominal structures, it will require increased extensor muscle forces to maintain the postoperative alignment. Patients might develop PJK as an energy-preserving posture or due to spinal structure failure under the muscular loads. The aim of this study was to test the hypothesized mechanism by evaluating trunk muscle effort in PJK patients vs. controls.

**Material and Method**: Adult spinal deformity patient data was retrieved from a multi-centric database and then grouped by complication status: PJK (N=41), other (N=75), or none (N=232). Spino-pelvic landmarks were annotated on X-ray data at three time points: pre-op, post-op, and follow-up. Patient-specific musculoskeletal models of corresponding alignments were built. The xiphoid process/pubic symphysis distance was

estimated in the models as a measure of abdominal wall length. Forces due to stretching of the abdominal wall beyond pre-op length (assumed slack) were applied in models, representing non-linear stiffness properties of the linea alba, rectus abdominis, and rectus sheath (Fig. 1). Inverse static simulations predicted muscle activities, the sum of which served to estimate overall muscle effort.

Fig 1.Flowchart of modeling steps and variables of interestexample of a patient who developed proximal junctional kyphosis (PJK) after spinal fusion



**Findings**: In the PJK and other complications groups, the abdominal wall was more elongated postoperatively (by  $+13\pm17\%$  and  $+10\pm15\%$ , p<0.001, Fig. 2) than in the no-complication group, which showed no change, but not anymore at follow-up. Consequently, greater muscle effort was estimated for post-op alignment in the PJK and other complications groups vs. no complications group (26.2 ± 25.9, 18.4 ± 22.3 vs. 8.8 ± 8.9, p<0.01). Muscle effort was reduced at follow-up in both groups. Limitations involve assessment of abdominal length (not visible in radiographs) and the assumption that tissues fully adapt to deformity.

Fig 2.Change in abdominal wall length (as % of pre-op) and muscle effort in post-operative (post-op) and follow-up (f/u) alignments.

Fig. 2 – Change in abdominal wall length (as % of pre-op) and muscle effort in post-operative (post-op) and follow-up (f'u) alignments.





**Result**: Patients with PJK showed greater abdominal wall elongation and muscle effort post-op vs. patients without complications, and both measures were reduced at follow-up. Changes in abdominal wall length due to adult spinal deformity correction might have implications for patient's ability to maintain post-op alignment long-term. Upon further research, these findings might have potential implications for surgical planning, or peri-operative rehabilitation.

**Keywords**: Proximal Junctional Kyphosis (PJK), Abdominal Wall Elongation, Adult Spinal Deformity (ASD), Postoperative Complications

# **Ref No: 5959**

### THE INVESTIGATION OF THE RELATIONSHIP BETWEEN LOWER INSTRUMENTED VERTEBRA LEVELS AND QUALITY OF LIFE IN ADOLESCENT IDIOPATHIC SCOLIOSIS PATIENTS OVER THE YEARS AFTER SURGERY.

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**Aim**: The aim of this study was to examine whether the quality of life of patients who underwent posterior fusion surgery and had different lower instrumented vertebra levels at similar postoperative times and patients with the same lower instrumented vertebra levels at different postoperative times changed using quality of life scales and to understand whether there is a threshold lower instrumented vertebra level that shows a significant difference in health-related quality of life.

**Material and Method**: In this study, patients who underwent posterior fusion surgery for adolescent idiopathic scoliosis at our hospital since December 2020 were retrospectively analyzed. After applying exclusion criteria to 765 patients, 463 were included in the study. A total of 120 patients (102 females, 18 males) agreed to participate in the study. SRS 22, Turkish version of the Spinal Appearance Questionnaire (Tr-SAQ), ODI and EQ-5D-3L PROM's were applied.Statistical analyses were conducted using Shapiro-Wilk normality tests, Mann-Whitney

U tests, Kruskal-Wallis analysis, Dunn-Bonferroni test, and Fisher-Freeman-Halton exact tests. The p value of <0.05 was considered statistically significant.

Patient flow chart



**Findings**: There were 14 (11.7%) patients with LIV at and above T12 level, 24 (20.0%) at L1 level, 14 (11.7%) at L2 level, 38 (31.7%) at L3 level, 22 (18.3%) at L4 level and 8 (6.7%) at L5 level. SRS-22r pain scores for T12 and above, L1, L2, L3, L4, L5 were 4.10(1.05), 3.90(1.30), 4.40(0.65), 4.30(0.85), 4.30(0.45), 3.60(1.55), respectively. SRS 22r pain scores of the patients differed statistically according to the levels (p=0.039). General well-being scores for T12 and above, L1, L2, L3, L5 were 80.0 (21.25), 90.0 (28.75), 90.0 (16.25), 90.0 (16.25), 90.0 (12.00), 75.0 (31.25), respectively. EQ VAS scores of the patients differed statistically according to the levels (p=0.029).

scatter plot showing the SRS-22r pain and EQ-VAS results according to the levels.



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 $Comparison \ of \ SRS-22r \ pain \ and \ EQ-VAS \ scale \ results \ according \ to \ the \ levels.$ 

	T12 and above	L1	L2	L3	L4	L5	P value
SRS- 22r Pain	4,10 (1,05) ab	3,90 (1,30) ab	4,40 (0,65)a	4,30 (0,85)a	4,30 (0,45)a	3,60 (1,55)b	0,039
EQ- VAS	80,0 (21,25) ab	90,0 (28,75) a	90,0 (16,25) a	90,0 (16,25) a	90,0 (12,00) a	75,0 (31,25) b	0,029

The data is summarized as median (interquartile range). ‡: Kruskal-Wallis Test, the superscripts a and b in the same row indicate the difference between levels. There is no statistically significant difference between levels with the same superscript.

**Result**: In comparing HRQoL by LIV, patients at the L5 level had statistically and clinically lower SRS-22r pain scores than those at L2, L3, and L4 levels. No significant differences were found between pain scores at other levels. Additionally, EQ VAS scores were significantly lower at L5 compared to L1, L2, L3, and L4 levels. No significant differences were found between pain scores at other levels. We believe that proper selection of fusion levels in AIS significantly affects HRQoL in the short, medium, and long term. Fusions up to the L4 lower instrumented vertebra, when performed with correct level selection and surgical techniques, show no significant long-term quality of life differences compared to AEVS, contrary to common belief.

**Keywords**: Adolescent Idiopathic Scoliosis, Lower Instrumented Vertebra, Health-Related Quality of Life

# Ref No: 5989

# PERCUTANEOUS STABILIZATION IN LUMBAR FRACTURES: CLINICAL OUTCOMES AND FUNCTIONAL ASSESSMENT

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**Aim**: Open surgical stabilization can exacerbate muscle damage caused by trauma. Patients undergoing open surgery often experience prolonged postoperative hospital stays and higher levels of pain. Percutaneous stabilization reduces muscle damage, potentially lowering the risk of postoperative complications. This study aims to evaluate the outcomes of patients who underwent stabilization using percutaneous techniques.

**Material and Method**: Between September 2016 and June 2024, 45 patients with lumbar fractures resulting from trauma, who did not require laminectomy, were treated with a percutaneous transpedicular screw-rod system (PTVRS) at Gaziantep Şehit Kamil State Hospital and Diyarbakır Gazi Yaşargil Training and Research Hospital. These cases were retrospectively analyzed. Preoperative and postoperative VAS and ODI scores, as well as hospital length of stay, were assessed at 1, 6, 12, and 24 months postoperatively.

Findings: The mean age of the patients was 37.6 years (range: 16–74), with 34 males and 11 females. Compression fractures were present in 32 patients (71.2%), and burst fractures in 13 patients (28.8%). The fractures occurred at L2 in 17 patients, L1 in 12, L3 in 8, L5 in 5, and L4 in 3 patients. Additionally, 27 patients had fractures at other vertebral levels, which did not require surgical intervention. Stabilization was performed at three levels in 36 patients, four levels in five patients, and five levels in four patients. The mean TLICS score was 5.2. The average follow-up period was 44.6 months (range: 6–74). Seven patients underwent implant removal due to fusion. The average hospital stay was 3.3 days (range: 2-5). The mean preoperative VAS score was 9.1, improving to 2.8 at 1 month, 1.7 at 6 months, 1.4 at 12 months, and 1.2 at 24 months. The mean preoperative ODI score was 87.7, decreasing to 25.6 at 1 month, 18.9 at 6 months, 14.3 at 12 months, and 11.7 at 24 months.

Result: Spinal stabilization is critical for muscle integrity,



especially in the lumbar region. Percutaneous stabilization minimizes muscle damage compared to open surgery, reducing perioperative blood loss. Furthermore, patients who undergo percutaneous procedures experience shorter hospital stays and quicker recovery times. While this study highlights the advantages of percutaneous stabilization, further research is needed to fully evaluate its long-term outcomes.

Keywords: Lumbar Fracture, Percutaneous, Stabilization, VAS-ODI Score

**Author Note**: Dear Editor, I am submitting my manuscript on the outcomes of percutaneous stabilization in lumbar fractures for consideration as an oral presentation at your esteemed conference. I believe it aligns well with the conference's scope.

# Ref No: 6024

# THE HYBRID JUNCTIONAL ROD: A NOVEL TECHNIQUE TO PREVENT PROXIMAL JUNCTIONAL KYPHOSIS

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**Aim**: Proximal Junctional Kyphosis (PJK) is a common complication in spinal deformity surgery, with reported incidence rates up to 55%, though typically averaging around 11%. Despite extensive research, no surgical technique has completely eliminated PJK. This study presents the early clinical outcomes of a newly developed rod system, the Hybrid Junctional Rod (HJR), designed to prevent PJK.

**Material and Method**: The HJR system consists of three components: (1) a standard rod, (2) a transitional segment allowing a tether-to-rod transition through a single screw, and (3) a tether made from polyethylene terephthalate (Picture1). The system was tested in an internationally accredited laboratory and shown to withstand up to 1100 N of force.During surgery, T6 and below were exposed using a subperiosteal technique, while T5-T2 levels were preserved with minimal dissection to maintain the posterior ligamentous complex. Standard pedicle screws were placed at T6 and below, a special screw for the transitional rod at T5, and monoaxial screws at T2-T4. Schwab type 2 osteotomy was performed at the deformity apex, with Schwab type 1 osteotomies at other thoracic levels below T5.After correction with temporary rods, the HJR was placed from T5 downwards. The tether component was fixed

sequentially at T4, T3, and T2 with decreasing tension from T4 to T2. Autografts and synthetic grafts were placed at T5 and below; no grafts were used at T2-T4. Patients were evaluated preoperatively with scoliosis radiographs, CT, MRI, clinical photographs, and SRS-22 and VAS scores. Postoperative follow-up included radiographs and clinical assessments at 1 month, 45 days, 3 months, 6 months, and 1 year.

Picture 1



The hybrid Junctional rod system consists of three components: (1) standard rod, (2) transitional segment allowing a tether-torod transition through a single screw, and (3) tether made from polyethylene terephthalate.

**Findings**: This technique was applied in 14 patients (7 males, 7 females), with a mean age of 22 years. Diagnoses included Scheuermann's kyphosis (9 patients), congenital kyphosis (2), neuromuscular kyphosis (1), degenerative kyphosis (1), and syndromic kyphosis (1). The average preoperative kyphosis Cobb angle was 79.6°, with planned corrections of approximately half the original angle (Picture 2 and 3). No perioperative or postoperative complications were observed. Throughout follow-up, no PJK, proximal junctional failure, rod breakage, screw loosening, or tether failure occurred.

### Picture 2



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Example case: 16 yeasr old male, preoperative and postoperative 6th month lateral xrays

### Picture 3



Example case: 16 years old male, preoperative and postoperative 6th months xrays

**Result**: The early clinical outcomes of the Hybrid Junctional Rod system are promising. Although long-term results are yet to be established, these initial findings suggest that the HJR may offer an effective new strategy for the prevention of PJK in spinal deformity surgery.

**Keywords**: Hybrid Junctional Rod, Kyphosis, Proximal Junctional Kyphosis, Spinal Deformity

# **Ref No: 6115**

# ACUTE CENTRAL CORD SYNDROME CAUSED BY A CERVICAL EPIDURAL ABSCESS

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Aim: Acute central cord syndrome (CCS) is a well-known clinical pattern of spinal cord injury (SCI) defined as a spinal lesion causing quadriparesis with relatively greater weakness in the hands and forearms than in the upper arms and legs. CCS is the most common type of incomplete SCI, comprising 15% to 25% of all cases. Acute CCS is typically seen in older patients with cervical spondylosis or younger patients with congenital cervical spinal canal stenosis who sustain a hyperextension injury. Trauma is the most common cause of CCS. However, CCS can also result from nontraumatic causes, such as cervicall epidural abscess. In this report, we present a case of acute CSS arising from a cervical epidural abscess in a 35-year-old woman and report the clinical, radiologic, and surgical findings with follow-up results. To the authors' knowledge, this is the second case of acute CSS caused by cervical epidural abscess reported in the literature.

**Material and Method**: A 35-year-old woman presented to the emergency department with complaints of severe neck pain, bilateral radiculopathy, hand weakness, numbness, and urinary retention. She had a total thyroidectomy 2 weeks ago. On neurologic examination, the patient was quadriparetic with upper extremity proximal 3/5 distal 2/5 and lower extremity 4/5. Cervical magnetic resonance imaging (MRI) revealed a 35.7x35x9.7 mm thick-capsulated collection in the epidural space at the C3-C5 level, consistent with an abscess causing cord compression and spinal canal narrowing. The abscess was highly signalized on T1-weighted sections (T1W) and was contrast-enhanced when contrast was applied (Figure 1, Figure 2). The patient with CRP: 66 mg/L, leukocyte: 21.100 u/L, hemoglobin: 10.1 g/dL, TSH: 50.2 m(IU)/L, fT3: 1.81 pg/mL, calcium: 7.02 mg/dL was taken to surgery.

Figure 1

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Epidural abscess compressing the cervical cord at the C3-C5 spine levels on T1W contrast-enhanced cervical MR sagittal sections

Figure 2



Epidural abscess on axial T1W contrast-enhanced MRI through the C4-5 disc level

urkishspine

**Findings**: Abscess drainage was performed through an anterior approach at the C4-5 level. Serratia marcescens and Serratia nematodiphilia grew from the abscess material. In addition, the urine culture also grew Serratia marcescens. The patient was given triple IV antibiotherapy for 4 weeks, oral single antibiotherapy for 8 weeks. The patient's neurologic deficit improved, and she mobilized within one week and all preoperative complaints were resolved. At the 9th month postoperative follow-up, the patient had no complaints, and neurologic examination was normal. Control cervical MRI showed no epidural abscess, and control cervical computed tomography did not show any instability problem.

**Result**: Cervical epidural abscess is one of the causes of nontraumatic CCS and surgery should be performed as early as possible for good outcome.

Keywords: Central cord injury, Epidural abscess, Osteomyelitis

# Ref No: 6223

# COMPARISON OF PERCUTANEOUS AND OPEN PEDICLE SCREW STABILIZATION TECHNIQUES IN THORACOLUMBAR FRACTURES: A RETROSPECTIVE STUDY

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<sup>1</sup>Ankara Etlik Şehir Hastanesi

**Aim**: Thoracolumbar fractures are common spinal injuries following trauma and often require surgical stabilization. Open pedicle screw fixation (OPSF) is a conventional method offering direct visualization and fusion advantages but may increase tissue damage and infection risk. Percutaneous stabilization (PPSF), as a minimally invasive alternative, promises reduced surgical trauma and faster recovery; however, it remains controversial regarding fusion success and radiation exposure. This study aims to compare the clinical outcomes of these two techniques.

Material and Method: Eighty patients diagnosed with

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thoracolumbar fractures between January 2024 and April 2025 were retrospectively analyzed. Patients were grouped as follows:PPSF Group: 43 patients treated with the percutaneous method.OPSF Group: 37 patients treated with open surgery.The surgical technique was chosen based on fracture type, patient condition, and surgeon preference. Evaluation criteria included surgical site infection, postoperative pain (VAS score), number of fluoroscopic images, screw pseudoarthrosis, and fusion success. Data were collected from medical records and short-term radiographs.

**Findings**: Infection: No infections occurred in the PPSF group, while 3 patients (8.1%) in the OPSF group required wound revision.Pain: The VAS score was 3.4 in the PPSF group and 4.6 in the OPSF group.Fluoroscopy Count: The average number of fluoroscopic images was 41.2 in PPSF and 6.2 in OPSF.Complications: In the PPSF group, 2 patients (4.7%) had pseudoarthrosis, and 1 patient (2.3%) experienced rod dislodgement; in the OPSF group, 1 patient (2.7%) had pseudoarthrosis.Fusion: Fusion success was lower in the PPSF group compared to the OPSF group.

**Result**: While PPSF stands out with lower infection risk and reduced pain, its disadvantages include a high number of fluoroscopic images and limited fusion potential. OPSF offers better stability and fusion outcomes but carries a higher infection risk. Patient characteristics and long-term goals should guide the choice of technique.

**Keywords**: Thoracolumbar fracture, Percutaneous stabilization, Open pedicle screw fixation

# Ref No: 6315

### BEHAVIOUR OF THORACIC CURVATURES AFTER PECTUS EXCAVATUM AND CARINATUM SURGERY: A RETROSPECTIVE ANALYSIS

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**Aim**: Pectus excavatum (PE) and pectus carinatum (PC) are the most common congenital chest wall deformities, sometimes requiring surgical treatment. The impact of thoracic surgery on spinal alignment remains unclear. This study retrospectively evaluates changes in upper thoracic (UT) and main thoracic (MT) curvatures following surgical correction in PE and PC patients and analyzes influencing factors.

**Material and Method**: Between 2008 and 2020, 433 PE and 148 PC patients who underwent surgical correction in the thoracic surgery department were assessed. UT curvature (T1–T6) and MT curvature (T6–T12) were determined by measuring Cobb angles on standing chest radiographs. All patients underwent sternal bar correction, and the number of bars, placement, and stabilizer orientation were recorded as potential risk factors. Postoperative UT and MT curvatures were measured on early and final follow-up standing radiographs. Preoperative and postoperative values were compared, and statistical analysis was performed using Pearson's correlation test.

**Findings**: The mean age at surgery was 17.1 years for PE and 16.6 years for PC, with a male predominance (82.9% and 82.4%, respectively). Substernal bars were removed at an average of 28 months in PE patients and suprasternal bars at 32 months in PC patients. Preoperative UT and MT Cobb angles in the PE group were 7.12° and 7.03°, increasing postoperatively to 8.47° and 7.20°. In the PC group, UT and MT angles were 4.5° and 10.02° preoperatively and 6.73° and 9.97° postoperatively. UT Cobb angles increased in 79.2% of PE and 81.1% of PC patients. MT Cobb angles increased in 49.2% of PE patients but decreased in 93.2% of PC patients. Despite these trends, numerical

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changes were minimal, and no statistically significant difference was found in pre- and postoperative UT and MT Cobb angles in either group. Additionally, no significant correlation was observed between curvature changes and the number of bars, stabilizer use, or orientation. However, a weak but statistically significant correlation was detected between preoperative and postoperative UT and MT curvature changes in PE patients (r=0.205, p=0.006).

**Result**: Our study found that the number of bars, stabilizer use, and orientation did not significantly influence thoracic curvature changes in PE and PC patients. Although no statistically significant difference was detected, there was a tendency for increased UT curvature in PE patients after thoracic surgery, while MT curvature changes varied. Surgical correction of chest wall deformities may biomechanically affect spinal alignment through costovertebral junctions.

**Keywords**: Pectus excavatum, Pectus carinatum, Upper thoracic curvature, Main thoracic curvature

# Ref No: 6324

# TANDEM SURGERY FOR METASTATIC SPINE TUMORS

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**Aim**: Metastases constitute the most common type of tumors in the spine.Their incidence is increasing in the population due to the prolonged survival of oncological patients.Approximately 40% of all cancer patients develop metastatic spine tumors (MST).Moreover, 20% of these patients require surgery due to instability and neurological compression. MSTs are found in the thoracic region in 70% of cases and at multiple levels in 86%. Various surgical approaches—single-stage and twostage—have been developed for the treatment of multi-level MSTs requiring surgery. In such cases, often accompanied by comorbidities, surgical procedures should be completed in a single session and in the shortest time possible. We believe that awareness of tandem surgery should be increased for patients with multiple MSTs.In this report, we aim to contribute to this awareness by presenting a case in our clinic in which tandem posterior corpectomy and posterior stabilization were performed in the thoracic and lumbar regions due to MST.

Material and Method: Case: A 70-year-old female patient presented with complaints of weakness in the legs and inability to walk. Neurological examination revealed paraparesis graded 3/5. Her medical history included hypertension, diabetes mellitus, and a right renal tumor operation two years prior. The pathology had revealed clear cell renal carcinoma, grade 2. She had completed chemotherapy and radiotherapy. Due to worsening leg weakness during chemotherapy, the patient was transferred from the oncology clinic.Whole-spine MRI revealed mass lesions in the T8 and L4 vertebral bodies, causing vertebral height loss and extending into the spinal canal with epidural compression and pathological contrast enhancement (Figure 1).SINS was 15, and ESCC-Bilsky was evaluated as stage 3. Surgical intervention was performed on different spinal levels in a single session. One neurosurgeon performed a posterior T8 corpectomy, placement of a T8 cage, and transpedicular screw fixation at T6-7 and T9-10. The second neurosurgeon performed a posterior L4 corpectomy, placement of an L4 cage, and transpedicular screw fixation at L2-3 and L5-S1 (Figure 2).

Figure 1



Th 8

L4

**Findings**: The patient underwent single-stage tandem surgery with a total operation time of 3.5 hours and an estimated blood loss of 800 cc. In the early postoperative period, neurological deficits improved.

**Result**: In patients with MSTs requiring multi-level surgical intervention, single-stage tandem surgery offers significant advantages, including shorter operative time and anesthesia exposure, reduced hospitalization duration, improved neurological outcomes, and better functional recovery. Therefore, it avoids the need for additional surgical interventions and further exposure to anesthetic agents. Moreover, postoperative rehabilitation and oncological treatments can commence earlier.

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### Figure 2



Torakal 8

Lomber 4

Keywords: Tandem Surgery, Metastatic, Spine Tumors

hospital stay and early posteoperative controls, were compared between the two groups.

**Findings**: Although no significant difference was observed in total blood loss and VAS scores, operation time, duration of analgesic use and hospital stay were found to be significantly shorter in patients operated under spinal anesthesia. (p<0.05)

**Result**: We wanted to show the usability and safety of spinal anesthesia as an alternative in revision surgeries . It may be useful where the second operation indication is placed at an older age, when general anesthesia cannot be administered and when preoperative planning is technically simple that expected duration is no longer than 3 hours.

**Keywords**: spinal anesthesia, regional anestehesia, lumbar revision surgery

# **Ref No: 6393**

# SPINAL ANESTHESIA IN LUMBAR REVISION SURGERY

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**Aim**: Lumbar revision surgery aims to increase the quality of life to some extent.Usually patient expectations are not very high and they believe such operations has low safety. The general tendency of spinal surgeons is to emphasize that a second surgery is riskier and to recommend consulting the doctor who performed the primary surgery if possible.Spinal anesthesia is widely used in short-term lumbar surgeries such as lumbar microdiscectomy, and there are studies showing that it has also been preferred in lumbar spine instrumentation surgeries in recent years. The purpose of our study is to discuss in which patients spinal anesthesia can be used in Lumbar Revision Surgeries, how safe it is, and its effectiveness by comparing number of variables with general anesthesia.

**Material and Method**: 30 lumbar revision surgery cases, 12 of which were operated under spinal anesthesia (Group 1)and 18 under general anesthesia (Group 2) between 2021-2025, were retrospectively examined. Total blood loss, operation time, duration of opioid analgesics and nonsteroidal anti-inflammatory drug use, hospital stay and Visual Analog Scale (VAS) scores on

# **Ref No: 6421**

# TOTAL LAMINECTOMY OR PARTIAL LAMINECTOMY IN PATIENTS UNDERGOING INSTRUMENTATION AND FUSION FOR LUMBAR SPINAL STENOSIS?

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**Aim**: Lumbar spinal stenosis is often the result of a gradual, degenerative aging process. Open or extensive decompressive laminectomy was previously the standard of care. The purpose of this study was to compare the postoperative bleeding and late clinical outcomes of total laminectomy and partial laminectomy in patients with symptomatic lumbar spinal stenosis who failed conservative treatment and underwent multilevel instrumentation and fusion.

**Material and Method**: In our clinic, 74 patients who were operated by the same surgeon between November 2021 and January 2024 were included in the study. These patients were divided into two groups. Patients who underwent equal-level decompression were selected; Group A consisted of 37 patients who underwent partial laminectomy in which the ligamentum flavum was completely excised and 1/3 of the cranial side of the lamina was preserved, and Group B consisted of 37 patients who underwent total laminectomy and flavum excision.



Posterior instrumentation was applied in both groups. In both patient groups; The amount of blood drainage was measured by looking at the VAS score at the 48th hour after surgery. They were followed up with ODI (Oswestry disability index) and VAS (visual analog score) for back and leg pain at first-year controls.

### Figure 1



Total and partial laminectomy area

Findings: The results showed that both groups achieved significant improvements in terms of Oswestry disability index. Group A was observed to have lower VAS scores in the first 48 hours after surgery (p=0.05). It was also observed that Group A is less than Group B in terms of postoperative blood drainage. In the first year controls; it was determined that the change observed over time in both approaches in VAS and ODI measurements compared to preoperative values showed a statistically significant difference in terms of response to treatment (p<0.05). No significant difference was observed between the two groups in terms of VAS (p=0.370) and ODI (p=0.517) scores in the first year controls after the procedure. There were significant improvements in both groups in terms of back pain. There were significant improvements in postoperative radicular leg pain in both groups. No difference was observed in terms of complications.

**Result**: Partial laminectomy and wide total laminectomy with posterior instrumentation were effective in treating multilevel lumbar spinal stenosis. Partial laminectomy and falvum excision were superior to total laminectomy in terms of less postoperative back pain, less blood loss, and greater bone stock for the fusion site.

**Keywords**: Lumbar spinal stenosis, total laminectomy, partial laminectomy

<u>Author Note</u>: In our study, we wanted to emphasize that partial laminectomy is more advantageous than total laminectomy unless necessary. We wish you a pleasant congress and thank those who contributed.

# **Ref No: 6487**

# SPINAL FUSION WITHOUT GRAFTING AND PRESERVING POSTERIOR ELEMENTS IN ADOLESCENT IDIOPATHIC SCOLIOSIS PATIENTS

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**Aim**: The aim of this study is to investigate the spinal fusion rates in adolescent idiopathic scoliosis (AIS) patients who underwent surgery with posterior elements preserved(spinous process preserved, lamina decortication performed, and no facetectomy) without grafting.

**Material and Method**: This study included 23 AIS patients who had at least 2 years of follow-up and underwent posterior instrumentation without any other surgical intervention.  $11\pm 2$  levels offusion were performed. Infections, surgery durations, transfusion requirements, intraoperative blood loss, hospitalization durations, and the need for intensive care were evaluated.Preoperative, early postoperative, first-year, and second-year radiographs of the patients were reviewed.

**Findings**: A total of 23 AIS patients (20 females, 3 males; mean age 15.1) were included. According to the Lenke

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Classification six patients are Type 2, 15 are Type 3, and 2 are Type 4. All 23 patients underwent  $11\pm2$  levels of posterior spinal instrumentation. The average surgery duration was 210 minutes, and the average hospitalization time was 4 days. Five patients required 1-day intensive care unit admission postoperatively. The average perioperative bloodloss was 450 cc. Eight patients required 1 unit of erythrocyte suspension transfusion, while 3 patients needed 2 units. One patient developed a deep tissue infection, which resolved after debridement, and antibiotic therapy. Another patient developed a superficial wound infection, which healed after superficial debridement.

**Result**: This study demonstrates that adequate spinal fusion can be achieved without grafting in AIS patients when posterior spinal instrumentation is performed with posterior elements preserved. Although conducted in a small population, this study shows that decortication and grafting may not be necessary for fusion and that posterior elements can be preserved. However, further studies with longer follow-up and larger patient populations are needed.

Preoperative radiography



Early postoperative radiography



urkishspine

Late period radiography



Keywords: scoliosis, adolescent, fusion, grafting

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# **Ref No: 6674**

# ASSESSMENT OF UPPER AND LOWER LUMBAR LORDOSIS IN ASYMPTOMATIC ADULTS: NEARLY 70% OF THE POPULATION EXHIBITS MORE THAN 35 DEGREES OF L4-S1 LORDOSIS

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**Aim**: Mechanical complications and adjacent segment disease following lumbosacral fusions are both costly and invasive. Revisions are mostly performed for sagittal malalignment, especially when the achieved segmental lordosis is less than the initial goal, often at L4-S1. Given these challenges an individualized planning of sagittal alignment parameters is essential for optimal patient outcomes. This retrospective, multicenter study aimed to evaluate sagittal alignment parameters in asymptomatic adult Turkish individuals with no history of spinal pathologies, in order to find out normative lumbar lordosis (LL) and related parameters with comparing formulas from recent literature.

**Material and Method**: A multi-center study with asymptomatic adult Turkish individuals with no history of spinal pathologies

were analyzed. Full-spine AP/LAT standing radiographs were obtained. Sagittal and coronal alignment parameters were measured. Pelvic incidence (PI), pelvic tilt(PT), sacral slope(SS), LL, L4-S1 lordosis, thoracic kyphosis(TK), SVA, T10-L2 angle, L1 pelvic angle(L1PA), and T1 pelvic angle(T1PA)were used for matching the ideal lower and upper LL for each individual according their PI using the most recent formulas in the literature. Pearson Correlation was used for statistical analysis.

**Findings**: 564 individuals (385F/179M) were included in the study. The mean age of the participants was 35.3(20-77) years, and the mean BMI was 23.9.The mean NRS for back pain was 1.5(0-4).Regarding coronal balance, the mean deviation was 2.1mm±6.8.The mean PI was  $50.4^{\circ}\pm10.8$ ,the SS was  $38.8^{\circ}\pm8.3$ ,and the PT was  $11.5^{\circ}\pm7.8$ .The mean LL was  $-60.4^{\circ}\pm11.0$ ,while TK measured  $44.6^{\circ}\pm10.8$ .The mean L4–S1 was  $-38.9^{\circ}$ .Additionally,the T10–L2 angle was  $5.9^{\circ}\pm8.0$ ,and the SVA was -17.0mm $\pm31.3$ .The L1PA was  $3.5^{\circ}\pm6.4$ ,and the T1PA was  $5.5^{\circ}\pm7.1$ . Estimated LL was congruent with the [PI×0.6+30] $\pm5$  formula in 49.4% of participants(p<0.01,r=0.735).Furthermore, L1PA was found to be in statistically significant with the formula L1PA=[PI×0.5-20] $\pm5$  in 76.4% of participants(p<0.001,r=0.725).

Demographic information of participants

	Mean (min-max)
n	564
	F:385 / M:179
Age	35,3 (20-77)
	F:35,4 / M:35,0
BMI	23,9 (17,3-38,7)
	F:24,0 / M:23,6
NRS back	1,5 (0-4)
ODI	6,5 (0-17,7)

**Result**: Accurate postoperative lumbar lordosis calculation is essential for long term sustainable lumbosacral fusions. According to our study our asymptomatic individuals data suggest that overall lumbar lordosis strongly correlates with L1PA(p<0.01)and lower LL (L4-S1) is the key amount of total lumbar lordosis(70%).In all age groups(20-77years)most of the asymptomatic adult spines(70.4%) has more than 35° L4-S1 lordosis and nearly 20° of total LL belongs to upper arch,which can give clue to the clinician to obtain enough lordosis at lowest part of the spine.This asymptomatic and pain free population shows that revisions after lumbosacral fusions predominantly may be associated with sagittal malalignment


with undercorrected segmental lordosis, often at L4-S1 and this lordosis is independent from aging.

Lateral (LAT) Standing Radiographs of 3 participants.



**Keywords**: Lumbar Lordosis, Asymptomatic Adult Population, Multi-Center Study, Sagittal Alignment, Pelvic incidence, L1 pelvic angle

## **Ref No: 6750**

#### POSTERIOR C1-C2 FIXATION METHODS AND RESULTS IN PATIENTS WITH TYPE 2 ODONTOID FRACTURES

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**Aim**: Odontoid fractures are widely common and reported to account for up to 15% of all cervical spine injuries. Combined atlas-axis fractures are rare occurrences that account for approximately 4% of all acute cervical spine injuries. Fusion between lateral masses of C1 and C2 is often sufficient to provide adequate treatment in these special cases. This study aims to share our clinical experience of twelve cases of odontoid fractures that underwent posterior C1-C2 fixation.

Material and Method: We retrospectively analyzed type 2

odontoid fractures of trauma who were treated surgically. The clinical and radiological presentation of each patient was described. Trauma etiology and fracture types were described in patients with type 2 odontoid fractures and associated C1 fractures. Various techniques were discussed in relation to C1-C2 stabilization.

**Findings**: The ages of patients in our study ranged from 32 to 90 years. Nine men and three women were included in study. Five patients with type 2 odontoid fractures also had C1 fractures. 10 patients were operated with the Harms-Goel technique. 2 patients underwent C1 lateral mass - C2 translaminar fixation. Postoperative control CT scans of two patients revealed vertebral artery infringement, but no associated clinical findings were observed. The mean follow-up period of the patients was 17 months. Fusion status was determined by CT and fusion was observed in all patients.

#### PREOP SAGITTAL CT



#### POSTOP X-RAY



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#### POSTOP THIRD MONTH CONTROL CT



**Result**: We concluded that Goel-Harms technique is an effective technique for C1-C2 fixation, but we think that in cases where C2 pedicle is thin or there is a unilateral vertebral artery circulation, C2 translaminar fixation may reduce the complication rate. Although other techniques have been defined, but we believe that the techniques we apply are sufficient.

Keywords: odontoid fracture, C1-C2 fixation, trauma

## **Ref No: 6770**

#### LUMBAR INTRASPINAL SYNOVIAL CYSTS: REPORT OF CASES WITH RADICULAR PAIN CAUSING NEUROLOGICAL DEFICIT.

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**Aim**: Juxta-facet cysts derives from facet joint, reveals itself through compression on posterior root or dural sac and causes complaints of disc hernia or narrow spinal canal. Intraspinal synovial cysts are rare causes of neurological defisit. In this article we'll present a case of lumbar synovial cyst which causes severe radiculopathy and neurological deficit.

**Material and Method**: Patients operated between years 2020-2025 and who had synovial cyst on their pathology reports

have been evaluated retrospectively. We examined patient complaints, neurological examinations and preoperative imagings. Patientsunderwentmicro discectomy with hemipartial laminectomy. PostoperativelyMR imagingwas performedon day 1.

**Findings**: We examined four male patients. Ages of the patients differed between 38 and 78 and the mean age is calculated as 56,5. 75 % of patients (3/4) had left radiculopathy and 50 % had neurological deficit. Preop lumbar MRI revealed synovial cyst deriving from L4-5 with a ratio of 75 % and deriving from L3-4 facet joint. Postoperative lumbar MRI showed totalexcision of lesions.Neurological deficits were not improved. The mean duration of follow-up was 6,25 months.

Figure 1:



Figure 1:Preoperative magnetic resonance imaging findings. A : Sagittal T2 image, demonstrating a cysticlesion at the L5 uppervertebral body level. Thecystshows a highsignalintensity. B : Axial T2 image. Thecystshows a highsignalintensity. The L4/ L5 discspacesexhibitminorfeatures of degenerationand do not communicatewiththecyst.

Figure 2:





Figure 2:Preoperative magnetic resonance imaging findings. A : Sagittal T2 image, demonstrating a cysticlesion at the L4 uppervertebral body level. Thecystshows a lowsignalintensity. B : Axial T2 image. Thecystshows a lowsignalintensity. The L3/ L4 discspacesexhibitminorfeatures of degenerationand do not communicatewiththecyst.

**Result**: Intraspinal cysts are rare causes of neurological defisit. These benign lesions can be totally resected surgically and they should be kept in mind for differential diagnosis of neurological defisit.

**Keywords**: intraspinal cyst, radiculopathy, synovial, neurological deficit

## **Ref No: 6781**

#### THE EFFECT OF THE SCHROTH METHOD ON THE CLINICAL AND RADIOLOGICAL RESULTS OF THE CONSERVATIVE TREATMENT OF ADOLESCENT IDIOPATHIC SCOLIOSIS

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**Aim**: To observe the effect of the Schroth method on the conservative treatment of adolescent idiopathic scoliosis (AIS)

**Material and Method**: Forty-three AIS patients who presented to the University of Mersin Faculty of Medicine, Department of Orthopedics and Traumatology between December 2020 and December 2023 were included in. Group 1 patients had only the Schroth method, Group2 had brace and Schroth method. Age, gender, Cobb angle, trunk rotation angle, proximal humerus ossification stage (Phos), brace usage was recorded intially and after a follow-up at least six months.

**Findings**: The age of the patients were 10 -18 years  $(13.18 \pm$ 2.0). 34 (79.1%) were female, and 9 (20.9%) were male. 22 patients (51.2%) used brace. The average Risser stage was 2.18  $\pm$  1.34, the average (Phos) stage was 3.13  $\pm$  0.98. There were 8 (18.6%) Risser 0, 4 (9.3%) Risser stage 1, 10 (23.3%) Risser stage 2, 14 (32.6%) Risser stage 3, and 7 (16.3%) Risser 4 patients. 3 patients (7%) were Phos stage 1, 7 (16.3%) Phos stage 2, 16 (37.2%) Phos stage 3, 15 (34.9%) Phos stage 4, and 2 (4.7%) Phos stage 5. In Group 1 mean Cobb angle was 15.95  $\pm$  5.42, thoracic trunk rotation angle was 2.38 $\pm$  1.77, mean thoracolumbar trunk rotation angle was 3.80 ± 2.19 ,lumbar trunk rotation angle was  $3.47 \pm 2.60$ . In Group 2, they were 28.50± 7.73, 4.95 ± 2.38, 7.09° ± 2.15, 4.13 ± 1.88 respectively. In Group1 the change in Cobb angle was  $5.47 \pm 3.15$ , the change in thoracic trunk rotation angle was  $0.76 \pm 1.13$ . the change in thoracolumbar trunk rotation angle was  $1.52 \pm 2.92$ , the change in lumbar trunk rotation angle was  $1.28 \pm 1.64$ . In Group2 they were  $6.59 \pm 4.37$ ,  $1.63 \pm 1.46$ ,  $2.59 \pm 1.791.68 \pm 1.42$  respectively. The change in Cobb angles between the groups was statistically insignificant, while the change in thoracic and thoracolumbar body rotation angles were significant. Ossification stage had no effect on the Cobb and trunk rotation angles.

**Result**: The Schroth method is effective in reducing Cobb and rotation angles in adolescent idiopathic scoliosis. Additional brace usage significantly improves thoracic and thoracolumbar rotations, but has no significant effect on Cobb lumbar trunk rotation angles .

**Keywords**: scoliosis, adolescent idiopathis scoliosis, Schroth method, brace treatment

<u>Author Note</u>: I believe that our study shall contribute to the conservative treatment of adolescent idiopathic scoliosis

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## **Ref No: 6782**

# SAGITTAL ALIGNMENT RECIPROCAL CHANCING AFTER LOMBER ANTERIOR VERTEBRAL BODY TETHERING

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<sup>1</sup>Muş Devlet Hastanesi <sup>2</sup>İstanbul Tip Fakültesi

**Aim**: The aim of study is to report the mid-term radiological results of thoracolumbar/lumbar vertebral body tethering (VBT) on sagittal alignment and the second aim is to compare VBT with selective thoracic fusion (STF) and non-selective fusion (NSF) groups in adolescent idiopathic scoliosis (AIS) patients. The VBT technique, applied to preserve movement and avoid possible fusion problems in AIS patients, continues to be increasingly used in spine surgery.

**Material and Method**: Patients who underwent surgery with a diagnosis of adolescent idiopathic scoliosis (AIS) were retrospectively evaluated and included in the study. All patients were categorized into three groups: VBT (n=17), NSF (n=19), and STF (n=15). Scoliosis Research Society (SRS)-22 and Oswestry Disability Index (ODI) scores were used at final follow-up for functional evaluation. The major curvature degree, coracoid height difference (CHD), sacral slope (SS), pelvic tilt (PT), pelvic incidence (PI), lumbar lordosis (LL), thoracic kyphosis (TK), cervical lordosis (CL), C7 tilt, sagittal vertical axis (SVA), T1 pelvic angle (TPA), and T1 spinopelvic inclination (T1SPI) were measured for radiological comparison.

**Findings**: The T1SPI value of NSF group cases was significantly higher than that of STF group cases (p=0.035; p<0.05). The mean decrease of  $8.85\pm7.85$  units in the final control value compared to the postoperative CHD value of the patients in the AVBT group was found to be significant (p=0.024; p<0.05). A statistically significant difference was found between preoperative and postoperative CL measurements and preoperative and last follow-up radiographs in the AVBT group (p=0.001; p<0.01). There was no significant difference in the patients' SRS-22 and ODI scores among the groups

**Result**: Conclusion: Cervical lordosis was found to be significantly improved after VBT surgery compared to preoperatively. In the evaluation of sagittal parameters, no significant advantage was found in the fusion group compared to the VBT group.

Keywords: lomber vertebral body tethering

# Ref No: 6867

#### OUR SURGICAL OUTCOMES IN PATIENTS UNDERGOING SEPARATION SURGERY FOR METASTATIC SPINAL TUMORS

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**Aim**: we believed that separation surgery combined with radiotherapy reduces perioperative and postoperative morbidity compared to en bloc resection or radical resection, so separation surgery and radiotherapy have been applied to our patients.

**Material and Method**: A total of 23 patients were included. The primary cancers included 11 lung, 8 breast, 1 prostate, 1 nasopharyngeal, 1 soft tissue sarcoma, and 1 testicular cancer. There were 3 cervical, 15 thoracic, 4 lumbar, and 1 sacral spinal metastases. Four patients received neoadjuvant, and 19 received adjuvant radiotherapy. The age range was 36-72 years. In all patients, at least two levels below and two levels above the affected vertebrae were instrumented with pedicle screws. Decompression was performed with wide laminectomy under a microscope, with a partial corpectomy on the affected side (the side with the lesion) and removal of the pedicle. Bone cement was applied to the corpectomy site.

**Findings**: Complications included 2 dura injuries requiring primary repair, 3 superficial infections, and 2 deep infections. Postoperative follow-up ranged from 5 to 67 months. Neurological stability was achieved in all patients. Consistent with the literature, there was no significant difference in tumor control between patients who underwent radical resection and those treated with separation surgery. However, separation surgery morbidity was found to be considerably lower than reported in the literature.

**Result**: Separation surgery combined with radiotherapy for metastatic spinal tumors results in low morbidity and effective tumor control, comparable to radical resection. The procedure achieved neurological stability in all patients. These findings suggest that separation surgery, as a less invasive alternative, can offer favorable outcomes with reduced perioperative and postoperative risks in patients with metastatic spinal disease.

**Keywords**: separation surgery, metastatic spinal tumor, radiotheraphy, instrumentation

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## **Ref No: 6908**

#### EFFECT OF PERIOPERATIVE SARCOPENIA TREATMENT ON THE DEVELOPMENT OF PROXIMAL JUNCTIONAL DISEASE IN ADULT SPINE DEFORMITY

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**Aim**: This study aimed to determine the effect of perioperative sarcopenia treatment on the development of postoperative proximal junction disease in elderly adult patients undergoing spinal deformity surgery.

Material and Method: Patients who underwent surgery with the diagnosis of adult lumbar degenerative deformity were included in the study. Inclusion criteria were determined as being 60 years of age or older, having a diagnosis of sarcopenia, having had 3 or more levels of long-level instrumentation, not having received any previous treatment for sarcopenia, and having a minimum of 1 year postoperative follow-up. Patients were evaluated for sarcopenia according to the Asian Criteria. DEXA was used to determine muscle mass. 6-meter walking speed and 5-times sit-to-stand test were used to determine muscle functions. Lumbar paraspinal muscle mass and psoas muscle mass and were measured using lumbar MRI (magnetic resonance imaging). Patients were divided into two groups as those who received perioperative sarcopenia treatment and those who did not. Nutritional regulation, protein-supplemented diet and resistance exercises were used in sarcopenia treatment (preoperative 3 months and postoperative 9 months). Patients were compared in two groups in terms of proximal junction disease development and clinical scores (VAS and ODI).

**Findings**: A total of 84 patients were included in the study. Perioperative sarcopenia treatment was applied to 35 patients (3M, 32F). Perioperative sarcopenia treatment was not applied to 49 patients (9M, 40F). In the group of treated patients, 2 patients developed proximal junction disease. In the untreated group, 9 patients developed postoperative proximal junction disease. In the statistical comparison, the p score was determined as 0.012 and the difference was determined to be significant. Postoperative 1st year clinical scores (VAS and ODI) were significantly better in the sarcopenia treatment group (p=0.005 and p=0.032).

**Result**: According to our study, perioperative sarcopenia treatment (protein-rich diet and exercise) increases muscle mass based on DEXA and radiological imaging, significantly reduces the development of proximal junctional disease after advanced age spinal deformity surgery, and positively affects postoperative 1st year clinical results (VAS and ODI scores).

Keywords: sarcopenia, deformity, proximal junctional disease

# Ref No: 7065

#### OUTCOMES OF BILATERAL DECOMPRESSION USING A UNILATERAL APPROACH IN PATIENTS WITH DEGENERATIVE SPINAL STENOSIS

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**Aim**: This study aims to demonstrate that decompression alone in patients requiring surgery for spinal stenosis results in lower morbidity and mortality rates, especially in elderly patients with significant comorbidities.

**Material and Method**: Degenerative spine patients with scoliosis of less than 20 degrees were included in the study. A total of 18 patients were followed for an average of 2 years (range: 1–3 years). The mean age of the patients was 71 years (range: 64–83). Among them, 4 had diabetes mellitus (DM), 9 had hypertension (HT), 7 had coronary artery disease, 2 had chronic kidney disease (CKD), 1 had chronic obstructive pulmonary disease (COPD), 1 had asthma, 1 had rheumatoid arthritis, and 1 had mitral valve prolapse. The average Body mass index (BMI) was 32 (range: 28–37). Decompression was performed at a single level in 6 patients, at two levels in 7 patients, and at three levels in 5 patients.

**Findings**: All patients showed significant neurological improvement and pain score reduction in the postoperative period. Only one patient required stabilization due to persistent



low back and leg pain at the two-year follow-up. No intraoperative or early postoperative complications were observed in any patient.

**Result**: Bilateral decompression using a unilateral approach in elderly patients with degenerative spinal stenosis and multiple comorbidities appears to be a safe and effective surgical approach. The procedure resulted in significant neurological and pain score improvements, with no intraoperative or early postoperative complications. The low morbidity and mortality rates observed in this study suggest that decompression alone can be a viable treatment option, minimizing surgical risks while achieving favorable clinical outcomes

**Keywords**: degenerative, spinal stenosis, decompression, unilateral approach

### **Ref No: 7129**

# THE EFFECT OF MILD LUMBAR SCOLIOSIS ON SPINOPELVIC PARAMETERS

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**Aim**: Studies on spinopelvic parameters have increased recently. The relationship between spinal and pelvic deformities and spinopelvic parameters has been demonstrated in various studies. It has been reported that values obtained through computed tomography (CT) might serve as a good alternative to standing X-ray imaging. This study aims to evaluate the spinopelvic parameters in individuals with mild lumbar scoliosis. Additionally, we made a separate evaluation of degenerative scoliosis by assessing young and elderly patients separately.

**Material and Method**: Between June 1, 2023, and June 31, 2024, patients who presented to the Orthopedics and Traumatology Emergency Department and outpatient clinics of Sincan Training and Research Hospital and had spinal and pelvic CT scans were included in the study. CT images were reviewed, and spinopelvic parameters were measured in sagittal imaging in patients with mild lumbar scoliosis. The Cobb angle was measured using the CT coronal sections. In patients with Cobb angles between 10° and 20°, the sacral slope (SS), pelvic tilt (PT), and pelvic

incidence (PI) angles were measured in sagittal images. Thirtyfive patients aged 18-30 years and twenty-four patients aged 50-70 years were included in the study. Measurements were also taken in a control group of patients without scoliosis, matched by age and gender distribution, for comparison.

**Findings**: In the young patient group with lumbar scoliosis, the average Cobb angle was 16.4 degrees, with 57% male patients. The spinopelvic parameters were measured as follows: PI 44.5°, PT 9°, and SS 35.8°. In the young patients without scoliosis, the spinopelvic parameters were PI 44.3°, PT 10°, and SS 36.2°. In the elderly patient group with degenerative scoliosis, the average Cobb angle was 18.1 degrees, with 58% female patients. The spinopelvic parameters in this group were PI 46.4°, PT 17.9°, and SS 30.2°. In the elderly patients without scoliosis, the spinopelvic parameters were PI 45.9°, PT 16.8°, and SS 29.5°.

**Result**: No significant differences in spinopelvic parameters were found in patients with mild lumbar scoliosis, either in the young or degenerative scoliosis group. Further studies are needed to determine at which degree of curvature the spinopelvic parameters are significantly affected.

**Keywords**: Spinopelvic Parameters, Adult Scoliosis, Degenerative Scoliosis

## Ref No: 7151

#### COMPARISON OF CHATGPT-3.5 AND GOOGLE BARD PERFORMANCE ON TURKISH ORTHOPAEDICS AND TRAUMATOLOGY NATIONAL BOARD EXAMINATION

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**Aim**: This study analysed the answers and comments of ChatGPT 3.5 and Google Bard, both Al models, to the questions of the 1st phase of the Turkish National Board Examination of 2024, which measures national competence in the field of orthopaedics and traumatology, and aimed to compare their performance.

**Material and Method**: This study is a comparative, crosssectional study thatevaluates and compares the performance of ChatGPT 3.5 andGoogle Bard, two AI speech models, on the 2024 TurkishNational Board Examination in Orthopedics



andTraumatology. The exam consists of 100 questions assessinggeneral orthopaedic knowledge. The following introductory sentence wasadded before each question: "The following question is anational board-level exam question in the field of orthopaedicsand traumatology. You are expected to read the question andrate its difficulty as "easy, medium, difficult" and give thecorrect answer." The performance of each AI model wasevaluated by comparing the proportion of correct answers theygave to the questions, their accuracy rates and the level ofdifficulty they recognised.

Table 2

	Difficulty levels (Gemini)	Accuracy rates (Gemini)
Difficulty levels (ChatGPT)	0.290	0.146
r	0.005*	0.165
р		
Accuracy rates (ChatGPT)	0.185	0.314
r	0.078	0.002*
р		

Correlations of difficulty levels and accuracy rates between ChatGPT and Gemini answers

Findings: It was found that ChatGPT 3.5 answered54.3% of the questions correctly, while Bard answered 45.7% of the questions correctly. There was no significant differencebetween the two groups in the accuracy of the AI models'answers to the questions (p=0.241). When assessing the difficulty of the questions posed by the AI models, ChatGPT3.5 reported that 3.3% of the questions were easy (n=3), 88% were medium, and 8.7% were difficult. Bard, on the otherhand, reported that 3.3% of the questions were easy (n=3),90.2% were medium, and 6.5% were hard. No significant difference was found between the two AI models indetermining the level of difficulty (p=0.654). When therelationship between the accuracy of the answers given and the difficulty of the guestions was evaluated within the group, nostatistically significant difference was observed between theresults of ChatGPT and Bard (p=0.541 and 0.611, respectively)(Table 1). When the correlation between difficulty level and accuracy rate was evaluated between the two AI models, it wasfound that both were correlated at a low level between twodifferent AI models (r=0.290 and p=0.005 for difficulty level;r=0.314 and p=0.002 for accuracy rate) (Table 2).

Table 1. Assessment of initial artificial intelligence responses by difficulty level as determined by the authors

	Chat GPT 3.5	Chat GPT 3.5	Chat GPT 3.5	Gemini	Gemini	Gemini	ра
	Incorre- ct n(%)	Correct n(%)	р-с	Incorre- ct n(%)	Correct n(%)	р-с	ра
Easy	2 (66.7%)	1 (33.3%)	0.541	2 (66.7%)	1 (33.3%)	0.611	0.654
Medium	36 (44.4%)	45 (55.6%)	0.541	45 (54.2%)	38 (45.8%)	0.611	0.654
Hard	4 (50.0%)	4 (50.0%)	0.541	3 (50.0%)	3 (50.0%)	0.611	0.654
p-b	0.241	0.241	0.241	0.241	0.241	0.241	

p-a : independent samples t-test for difficulty levels of the questions between two groups, p-b : independent samples t-test for accuracy of the questions between two groups, p-c : chi-square test for analyzing correct answer rate by difficulty category

**Result**: ChatGPT-3.5 and Google Bard had similar performancesinanswering the Turkish Orthopaedics and TraumatologyNational Board Examination, but chatGPT-3.5 led with asuccess rate of 54.3%. The two AI language models also foundsimilar levels of difficulty in the questions. Moderatecorrelations were found between the accuracy rates of the twoAI models, as well as between their difficulty levels.

**Keywords**: accuracy, Bard, ChatGPT-3.5, difficulty, orthopedics, artificial intelligence, ai

<u>Author Note</u>: We couldn't find appropriate subgroup for our abstract. Since the exam is mostly consists of trauma questions, we chose a trauma subgroup. Thanks in advance, best regards.

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## **Ref No: 7182**

#### THE EFFECT OF UNILATERAL BIPORTAL ENDOSCOPIC DISCECTOMY ON GAIT SPEED AND PATTERN IN PATIENTS WITH LUMBAR DISC HERNIATION

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**Aim**: Lumbar disc herniation (LDH) at L4-L5 and L5-S1 affects gait as the L5 and S1 nerve roots control key muscles in foot clearance, push-off, and weight-bearing. Unilateral biportal endoscopic discectomy (UBE) has been increasingly used as a minimally invasive alternative to conventional microdiscectomy. However, its impact on gait biomechanics remains inadequately studied. This propsective study aims to evaluate the effect of UBE on gait speed and symmetry in patients with LDH at L4-L5 or L5-S1 levels using smartphone-based gait analysis.

L5 and S1 Radiculopathies Disturb Gait

Muscle	Function	Effect of L5 Radiculopathy on Gait	Effect of S1 Radiculopathy on Gait
Tibialis Anterior	Controls foot dorsifiexion during swing phase to clear the foot; prevents foot slap at initial contact	Foot drop causing high- stepping galt (steppage galt) or foot slap at initial contact	
Extensor Hallucis Longus (EHL)	Aids in toe extension during push-off phase	Reduced push-off strength; difficulty lifting the big toe	
Extensor Digitorum Longus (EDL)	Extends toes during swing phase to assist with foot clearance	Difficulty clearing the toes during swing, leading to compensatory hip/knee flexion	
Gluteus Medius & Minimus	Stabilizes the pelvis during stance phase to prevent contralateral drop	Trendelenburg gait (contralateral pelvic drop during stance phase)	
Tensor Fasciae Latae (TFL)	Assists in hip flexion and internal rotation during swing phase	Reduced hip stabilization, leading to subtle instability during stance phase	
Hamstrings (Biceps Femoris,	Assists in knee flexion and hip extension during terminal	Mild difficulty with knee flexion and propulsion during push-off	
Gastrocnemius	Plantarflexion of the ankle (push-off during gait)		Weak push-off, reduced gait velocity, difficulty with toe walking
Soleus	Plantarflexion and postural balance		Reduced stance phase stability, difficulty maintaining balance
Gluteus Maximus	Hip extension and stabilization during stance phase		Weakened hip extension, leading to reduced propulsion and instability
Biceps Femoris (Long Head)	Knee flexion and hip extension		Weak knee flexion, mild impact on stride efficiency
Semitendinosus	Knee flexion and hip extension		Weak knee flexion, leading to less effective gait mechanics
Semimembranosus	Knee flexion and hip extension		Weak knee flexion, affecting gait symmetry



**Material and Method**: Patients undergoing UBE for symptomatic LDH were included. Exclusion criteria comprised neurological, musculoskeletal, or cardiopulmonary conditions affecting gait. Preoperative gait analysis was conducted one day before surgery, and postoperative assessments were performed on postoperative week 6. Healthy controls were also evaluated for comparative analysis. Gait parameters, including gait velocity (m/s), step time (ms), step length (m), cadence (steps/min), step time symmetry (%), step length symmetry (%), and vertical center of mass displacement (VERT-COM, cm), were measured using the Gait Analyzer smartphone application. Pain levels were assessed via Visual Analog Scale (VAS).

**Findings**: The study included 30 patients (mean age: 47.2  $\pm$  6.8 years) and 30 age and gender-matched healthy controls. Preoperatively, LDH patients exhibited significantly lower gait velocity (0.84 vs. 1.14 m/s, p<0.001), shorter step length (0.58 vs. 0.64 m, p=0.007), and reduced cadence (91.9 vs. 106.8 steps/min, p<0.001) compared to controls. Step time and step length asymmetry were significantly higher in LDH patients (p<0.05), and VERT-COM was reduced (1.98 vs. 2.57 cm, p=0.011). Postoperative week 6 analysis showed significant improvements in gait velocity (1.07 m/s, p<0.05), cadence (100.7 steps/min, p<0.05), and VERT-COM (2.45 cm, p<0.05). Step time symmetry remained impaired compared to healthy controls (p<0.001). VAS scores showed significant improvement (p<0.001).

Spatiotemporal Gait Parameters in L5 and S1 Radiculopathies

Gait Changes in L5 and S1 Radiculopathy				
Gait Parameter	L4-L5 Herniation (L5 Radiculopathy)	L5-S1 Herniation (S1 Radiculopathy)		
Gait Speed	↓ Slower due to foot drop & instability	↓↓ Slower due to weak push-off & pain		
Step Length	↓ Reduced due to weak dorsiflexion	↓↓ Reduced due to poor propulsion		
Step Time	1 Longer due to slow foot clearance	↑↑ Longer due to weak push-off & stance instability		
Step Length Asymmetry	1 More asymmetric due to foot drop	1 Asymmetry from weak push-off		
Step Time Asymmetry	1 Longer step time on affected side	↑↑ Delayed stance transition		
VERT-COM	↓ Less pelvic stability & weight shifting	↓↓ Less push-off & vertical propulsion		
Cadence	↓ Fewer steps due to slow transitions	$\downarrow\downarrow$ Fewer steps due to poor balance & propulsion		

**Result**: Endoscopic disc surgery significantly improves gait by reducing nerve compression with minimal surgical trauma. Unlike traditional microdiscectomy, which requires muscle retraction and partial bone removal, endoscopic approach preserves spinal structures, leading to faster recovery of motor function and reduced postoperative pain. This allows patients to regain gait velocity, cadence, and step length more quickly. Additionally, by decompressing the affected nerve root more precisely, UBE facilitates faster recovery of foot dorsiflexion (L5) and push-off strength (S1), which in turn improving propulsion



and foot clearance. While most parameters approach healthy levels by week 6, persistence of step length asymmetry could be explained by prolonged muscular adaptation and residual biomechanical imbalances, necessitating targeted rehabilitation strategies.

Endoscopic Disc Surgery Improves Gait

Ga

Factor	How Endoscopic Surgery Improves Gait
Muscle Preservation	Preserves paraspinal muscles with a minimally invasive approach, leading to faster recovery of lumbar stabilization and postural control.
Reduced Postoperative Pain	Less soft tissue trauma results in lower postoperative pain, allowing for more natural gait mechanics and earlier return to normal walking.
Faster Nerve Root Recovery	Precise decompression with minimal collateral damage enables quicker recovery of foot dorsiflexion (L5) and push-off strength (S1), reducing gait asymmetry.
Minimal Scar Tissue Formation	Minimizes epidural fibrosis, reducing nerve irritation and preventing long-term gait abnormalities.
Early Postoperative Mobilization	Allows for earlier rehabilitation and walking, preventing muscle deconditioning and improving step length and cadence.
Better Spinal Biomechanics	Maintains spinal stability by avoiding unnecessary bone removal, leading to better weight distribution and balance during gait.

**Keywords**: unilateral biportal endoscopic disc surgery, I5 radiculopathy, s1 radiculopathy, gait analysis, spatiotemporal, smartphone

## **Ref No: 7358**

#### INCIDENCE OF PROGRESSIVE SEGMENT DEGENERATION AT DECOMPRESSION AND ADJACENT SEGMENTS AFTER MICROSCOPIC DECOMPRESSION: 5-YEAR FOLLOW-UP

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**Aim**: We aimed to investigate the incidence of progressive segment degeneration (PSD) at the decompression and adjacent segments after microscopic or microendoscopic bilateral decompression surgery via an unilateral approach (MBDU) 5-year follow-up.

**Material and Method**: The investigated data of 168 patients (mean age,  $69.5 \pm 9.2$  years) who underwent MBDU for >5 years follow-up. Visual Analogue Score (VAS) scores for low

back, leg pain, and numbness, and Japanese Orthopedic Association (JOA) scores for back pain. Changes in the disc height and movement of the adjacent lumbar segments were compared using preoperative and 5-year postoperative lateral full-length standing whole-spine X-ray. PSD was defined as loss of disc height > 3 mm and progression of anterior or posterior slippage > 3 mm. The incidence and clinical impact of PSD were investigated.

Measurement method



Measurement of intervertebral disc height and slippage from L1/2 to L5/S

The method of measurement on whole spine standing x-ray.

**Findings**: Radiological ASD was observed even in the case of decompression surgery alone. However, no correlation with symptom deterioration, measured by the VAS and JOA scores found.ASD was observed even in the case of decompression surgery alone but Radiological ASD.

**Result**: 1: JOA score improved significantly from 13.4 points preop to 24.1 points at the latest follow-up (mean recovery rate 67.8%). 2: PSD at the decompression site was observed in 43.5% (73/168) of the patients. 3: Patients with loss of disc height > 3 mm and slippage progression were 16.1% (27/168) and 36.9%, respectively (62/168: 41 anterior and 21 posterior). 4: The PSD of the patients at the adjacent segment was 20.5% (35/168), with 5.4% (9/168) of the patients with loss of disc height > 3 mm and 16.0% (27/168: 13 anterior and 14 posterior) with slippage progression. 5: No significant difference in the clinical outcomes between patients with and those without PSD was found.

Keywords: Adjacent Segment Degeneration ASD, Progressive

# XVI. International<br/>TURKISH SPINE<br/>CONCERESUpdates and New Horizons in<br/>Spinal Surgery.My 22-25, 2025 / La Blanche Island, Bodrum

Segment Degeneration PSD, Microscopic/Microendoscopic Bilateral Decompression via Unilateral Approach

<u>Author Note</u>: Hello dear professors, I hope this note finds you safe and sound. I am excited to attend this academic congress and share my findings with you and also with dearly respected surgeons and researchers. However, this research is reported for the first time by me, and it was published in the JNS journal.

## **Ref No: 7440**

#### A TREATMENT OPTION FOR LONG-TERM COMPLICATIONS OF LUMBAR INSTRUMENTATION: REMOVAL OF THE INSTRUMENTATION SYSTEM

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**Aim**: Revision surgery is often required in neurosurgery due to adjacent segment disease (ASD), instrumentation failure (IF), and implant infections following lumbar spinal fusion. This study evaluates the clinical and radiological outcomes of lumbar instrumentation removal, hypothesizing that it may improve ASD symptoms and aid in the treatment of IF and infections.

Material and Method: Between 2023 and 2024, 21 patients (18 female, 3 male) who had previously undergone lumbar spinal instrumentation and later had it removed at our clinic were prospectively analyzed. Implant removal was performed in patients with severe low back pain during upright walking, postoperative anteflexion posture while walking, or neurogenic claudication (NC) with MRI-confirmed adjacent disc space narrowing and/or ASD. Additionally, patients with CT findings of implant loosening or fracture, as well as those diagnosed with spondylodiscitis, were included. Among the 21 patients, 18 had low back pain even at rest, 10 exhibited anteflexion posture with worsening pain when standing upright, 7 had NC, 9 had ASD and 11 had IF(3 implant fracture, 2 infection). All patients underwent complete implant removal. Postoperatively. bone mineral density was assessed using dual-energy X-ray absorptiometry (DEXA), and all patients were mobilized with a thoracolumbar spinal orthosis (TLSO) for three months. Pain levels were evaluated using the Visual Analog Scale (VAS), with clinical follow-ups at three months and MRI assessments at six months.

**Findings**: At the three-month follow-up, the mean VAS score among 18 patients with low back pain decreased from 7 to 3.9. Significant improvement was observed in all 7 patients with NC, with an average 70% increase in walking distance. Postural correction was achieved in all 10 patients with anteflexion posture. DEXA results revealed osteoporosis in 4 patients and osteopenia in 3, who were referred for endocrinologic treatment. All 11 patients with IF experienced low back pain relief. At six months, MRI showed ASD improvement in 4 of 6 evaluated patients.During the study period, two patients with spondylodiscitis experienced recurrence despite antibiotic therapy, requiring an additional three months of treatment. One patient sustained an L3 fracture after a fall, necessitating prolonged TLSO use, with confirmed healing at follow-up.

#### Figure 1



MRI of adjacent segment disease with improvement after implant removal

**Result**: Implant removal suggests that spinal instrumentation is a viable alternative to implant lengthening procedures for longterm complications. These findings emphasise the need for reevaluation of surgical strategies.

**Keywords**: Removal Of The Instrumentation System, Instrumentation Failure, Adjacent Segment Disease

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## **Ref No: 7531**

# INVESTIGATION OF THE NEUROPROTECTIVE EFFECT OF TANNIC ACID IN EXPERIMENTAL SPINAL CORD INJURY

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**Aim**: The aim of current treatment methods in spinal cord trauma is to prevent secondary damage to alive neuronal tissue or to minimize the conditions that this damage will cause. In experimental studies conducted to date, the effects of various agents on spinal cord injury have been investigated and some have shown that neurological functions improve. Our aim in this study is to present the neuroprotective effect of tannic acid, an antioxidant and anti-inflammatory molecule, in the secondary damage mechanism of the traumatic spinal cord, with motor functional, pathophysiological and biochemical parameters.

**Material and Method**: Twenty-four rats were randomly divided into four groups. The control group (group A), where only laminectomy was applied and no trauma, the laminectomy and trauma group (group B), the groups in which tannic acid applied 40 mg/kg systemically (groupC) and 2% locally to the operation area (groupD) after laminectomy and trauma. The clip compression model was used to create spinal cord trauma. The motor examination of rats was evaluated with Tarlov Scoring. GSH, SOD and MDA levels were measured in blood and spinal cord tissues. After sacrification, spinal cord tissues were examined as histopathologically with Malinowsky Scoring. Data analyzed with SPSS 27.0 at 95% confidence level.

**Findings**: In biochemical evaluation, MDA values in the blood before sacrifice decreased in the tannic acid applied groups compared to the control group, SOD values increased and GSH values increased only in the local tannic acid applied group. In local application group, the blood MDA value on the 3rd postoperative day showed a significant decrease compared to the operation day (p<005). In systemic application group,

postoperative SOD values increased significantly compared to the operation day (p<0.05). Tissue GSH values in systemic application group were significantly higher than the control and trauma groups (p<0.05). Tarlov scores in the tannic acid applied groups showed a significant increase compared to the operation day and this increase was significantly higher than in the trauma group (p<0.05). Although statistically significant in histopathological examination, the clinically positive effect was observed mostly in systemic application.

Motor function analysis

	Group A	Group B	Group C	Group D
Day 0 / Day 3 change p	0,157 <sup>w</sup>	1,000 <sup>w</sup>	0,038 <sup>w</sup>	0,026 <sup>w</sup>
Day 0 / Day 7 change p	0,157 <sup>w</sup>	1,000 <sup>w</sup>	0,026 <sup>w</sup>	0.023 <sup>w</sup>
w : Wilcoxon test				

Analysis of p values of changes in Tarlov scores between day 0 and days 3 and 7 of the operation

Biochemical analysis

SOD	Group A	Group B	Group C	Group D
Day 0 / Day 3 change p	0.005 <sup>w</sup>	0,138 <sup>w</sup>	0,028 <sup>w</sup>	0,138w
Day 0 / Day 7 chan- ge p	0,715 <sup>w</sup>	0,028 <sup>w</sup>	0,043 <sup>w</sup>	0,465 <sup>w</sup>
MDA				
Day 0 / Day 3 change p	0,893 <sup>w</sup>	0,225 <sup>w</sup>	0,345 <sup>w</sup>	0,043 <sup>w</sup>



	Diffe-	Diffe-	Diffe-	Diffe-	Diffe-	Diffe-
	rence	rence	rence	rence	rence	rence
	in GSH	in GSH				
	values	values	values	values	values	values
	betwe-	betwe-	betwe-	betwe-	betwe-	betwe-
	en	en	en	en	en	en
	Group	Group	Group	Group	Group	Group
	A/	A/	A/	B/	B/	C/
	Group	Group	Group	Group	Group	Group
	B (p)	C (p)	D (p)	C (p)	D (p)	D (p)
Tissue GSH	0,522	0,016	0,109	0,025	0,522	0,078

w : Wilcoxon test

**Result**: Tannic acid applied groups showed statistically significant results in biochemical and motor functional evaluations. Significant increases were observed only in antioxidant parameters in systemic applications compared to local applications. According to the results obtained from this study, tannic acid was shown to have a clinically positive effect in spinal cord injury with antioxidant and anti-inflammatory cellular response.

Keywords: spinal cord injury, oxidative stress, tannic acid

# **Ref No: 7549**

#### THE RELATIONSHIP BETWEEN PREOPERATIVE MORPHOLOGY OF THE INTERVERTEBRAL DISC ADJACENT TO THE UPPER INSTRUMENTED VERTEBRA AND ADJACENT SEGMENT DISEASE

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**Aim**: Adjacent segment degeneration (ASD) is defined as the degeneration occurring in the mobile segment adjacent to a spinal segment that has undergone fusion. Disc degeneration is the most common manifestation of ASD, attributed to increased mechanical stress and range of motion following spinal fusion. Previous studies have demonstrated that disc height loss and segmental hypermobility are key features of degenerative disc disease. The objective of this study was to evaluate the

influence of the preoperative morphology of the intervertebral disc adjacent to the upper instrumented vertebra (UIV) on postoperative segmental mobility and disc degeneration.

**Material and Method**: Patients who developed ASD following thoracolumbar posterior spinal instrumentation were retrospectively reviewed. Patients treated with dynamic screws or rods were excluded. For each patient, the level of the UIV and the number of instrumented levels were documented. Preoperative and postoperative radiographic measurements included the Cobb angles at the UIV and UIV+1 levels, as well as the angulation of the adjacent intervertebral disc. The Pfirrmann grade, anterior and posterior disc heights, and disc angulation adjacent to the UIV were also assessed preoperatively.

**Findings**: The study included 51 patients (39 males, 12 females) with a mean age of 64.5 years. The mean number of instrumented vertebrae (excluding iliac screws) was 4.67  $\pm$  2.59. The average time from initial surgery to ASD diagnosis was 28.4 months. The mean preoperative disc angulation was 3.57°, which significantly increased to 8.11° at the time of ASD diagnosis (p < 0.05). The anterior disc height decreased from 11.06 mm preoperatively to 10.54 mm postoperatively, while the posterior disc height decreased from 6.65 mm to 3.54 mm (p < 0.05). Discs with higher preoperative Pfirrmann grades and greater anterior-posterior height disparity demonstrated more pronounced postoperative angulation changes (p < 0.05). No significant correlation was found between the Pfirrmann grade and changes in spinal canal diameter.

**Result**: In thoracolumbar instrumentation planning, particularly at transitional zones, it is crucial to ensure the adjacent segment at the UIV is free from pre-existing degenerative changes. Our findings suggest that greater preoperative disc height and increased anterior-posterior height disparity at the UIV level are associated with greater postoperative mobility, thereby accelerating adjacent segment degeneration.

**Keywords**: adjacent segment degeneration, adjacent segment disease, disc degeneration, spinal instrumentation

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## **Ref No: 7685**

#### MORE THAN SCHMORL'S NODES: RELATIONS WITH CHRONIC DISEASES AND DEMOGRAPHICS IN TURKISH POPULATION

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**Aim**: Schmorl's nodes (sns) are commonly seen in vertebral imaging of the normal adult population referred for different reasons. This finding can also be seen in some pathogical conditions, especially in degenerative problems of the spine. Our aim in this study was to investigate the frequency of SN in a large degenerative lumbar spine database and to identify associated systemic diseases.

**Material and Method**: Patients who underwent lumbar MRI due to any degenerative lumbar spine problem between 2021 and 2025 at a tertiary university hospital were retrospectively screened. Lumbar MRIs in which SN was detected were confirmed by another radiologist other than the radiologist who wrote those reports. Among the patients with SN, comorbidities and demographic characteristics of those who could be reached were recorded via telesurvey method or through the Ministry of Health archive system.

**Findings**: A total of 4892 patients were retrospectively screened for lumbar MRI. It was determined that there were 118 patients with SN. Of the patients with SN, 42 (35.5%) were male and 76 (64.5%) were female. Mean age was 47.3 (between 18-80). It was observed that 73% (86 patients) of the patients were under 60 years of age and the majority were between 36-47 years of age.The most common comorbidities accompanying this finding were observed to be endocrine diseases (39%; thyroid disease 16% and type 2 diabetes 14% and 9% vitamin D deficiency)

SN' age distribution



**Result**: In this study, we showed that the development of SN in the Turkish population of Caucasian origin may be independent of age and associated with endocrine-metabolic diseases. We found that in our population, female gender is the dominant gender in terms of SN.

Keywords: lumbar spine, schmorl's node, MRI, epidemiology

## **Ref No: 7688**

#### RELAPSE OF CONGENITAL SCOLIOSIS AFTER HEMIVERTEBRECTOMY AND POSTERIOR FUSION SURGERY WITH EGGSHELL PROCEDURE, A CASE REPORT

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**Aim**: Congenital scoliosis is a progressive deformity that occurs as a result of vertebral developmental defects between the 4th and 6th week of gestation (1,2). Hemivertebra is one of the most common causes of congenital scoliosis (3).Our aim in presenting this patient was to add to the literature the recurrence of scoliosis in a patient with congenital scoliosis who underwent hemivertebrectomy and posterior fusion using the eggshell technique.



**Material and Method**: Our patient, a two-year-old girl, was referred because of a recognised lumbar curvature. Physical examination was normal (Figure 1). A fully segmented hemivertebra was found at the level of S1. Orthoröntgenographic evaluation revealed a truncal shift and an L5-S1 Cobb angle of 38 degrees (Figure 2).

Trunkal Shift And L5-S1 Cobb Angel.



Findings: Following our standard posterior surgical procedures, transpedicular polyaxial screws were placed, hemivertebrae carcinoma bone was removed and autograft was used for fusion. Rods were placed and the deformity was corrected. The patient was post-operatively placed in a trunk cast and early mobilised (Figure 3). The patient was followed in a cast for the first month and then in a Boston brace for 5 months. At the twenty-fourth month follow-up, it was noted that the trunk had shifted and the scoliosis had recurred (Figure 4 a-b). Revision surgery was planned.Second operation; first the remaining hemivertebra was removed in the supine position via an anterior retroperitoneal approach. Then, in the prone position, the lumbar pedicle screws were revised and a cage was placed posteriorly. In addition, a double rod was placed on the convex side where the growth was present. One level above and one level below the vertebra was included in the instrumentation. The procedure was terminated after correction was achieved (Figure 5). The patient was mobilised without a splint on postoperative day 1.

**Result**: In this case report, we conclude that the eggshell approach may be preferred for hemivertebrectomy in congenital

scoliosis because it is safer and causes less morbidity, but as a complication of this procedure, if the vertebral body is not adequately decanted, the vertebral body may continue to grow and the deformity may recur. We believe that safe excision of the hemivertebra with anterior surgery followed by the addition of non-fusion fixation from the fusion level to the upper vertebra and iliac canal will contribute to the healing of the trunk slippage by increasing stability and that this operation may reduce the likelihood of recurrence compared with single-level fusion.

**Keywords**: Congenital Scoliosis, Hemivertebrectomy, Eggshell Procedure

<u>Author Note</u>: Radiographic images of all follow-ups of our patient are available, and I was able to upload a single radiograph because the system allows single film upload.

## **Ref No: 7738**

#### NOT JUST ALIGNMENT: BODY SHAPE IS A KEY FACTOR IN ADULT SPINAL DEFORMITY BIOMECHANICS

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**Aim**: Adult spinal deformity (ASD) surgery aims to alleviate pain and restore alignment, particularly in the sagittal plane. High mechanical complication rates (28-61%) suggest that optimal spinal biomechanics is often not restored. Clinical consideration of sagittal balance currently disregards interpersonal variability in body shape. The aim was to assess the relative effects of spinal sagittal alignment and body shape, i.e. body mass distribution along the spine, on the location of the trunk center of mass (CoM) and spinal loads.

Material and Method: Sagittal alignment data (vertebral positions and orientations) of 754 ASD patients (615F+139M, Age=53.0±21.0. BM=63.7±12.5. BMI=23.9±4.4) were retrospectively obtained from a clinical database. Trunk mass distribution data (segmental masses and CoM locations) were assessed in healthy male volunteers (healthy weight: N=10, Age=35.3±8.5, BM=77.2±8.6 kg, BMI=24.0±1.5) and those with obesity (N=9, Age=33.3±9.8, BM=100.0±8.6 kg, BMI=32.1±2.3) using a reported method. An established musculoskeletal spine model (AnyBody) created synthetic models for each sagittal alignment and trunk mass distribution combination (Fig.1). Trunk CoM was analyzed, and inverse dynamic simulations of upright posture and 30° flexion estimated joint forces. A factorial analysis with generalized linear models evaluated the relative effect [%] of sagittal alignment vs. body shape on trunk CoM and spinal forces at thoracic and lumbar levels.

Fig 1. Study design.



Sagittal alignments of patients with ASD are assumed for each of the available measures of body shape (trunk mass distribution) to create multiple musculoskeletal models representing two synthetic patient populations (healthy-weight and with obesity). Measured positions of vertebral centroids and CoM locations are expressed as % of patient body height (%BH). CoM locations are measured from the vertebral centroids. Segmental masses are expressed as % of body mass (%BM).

**Findings**: Anteroposterior location of the trunk CoM was primarily determined by sagittal alignment (rel. effect: 96% in the healthy weight, 89% in the obesity group). In the healthy-weight population, the body shape effect dominated compressive loads at T1-T2 (rel. effect 98%), gradually decreasing to 20% at T7-T8 and T8-T9 as sagittal alignment became increasingly significant. At the thoracolumbar junction and lumbar segments, body shape and alignment contributed comparably to spinal loads, with relative body shape effects of 42-60% (Fig.2). In the obesity group, mass distribution was a dominant factor (55-98%) at upper thoracic levels (T7-T8 and above) and had a moderate effect (14-40%) at other segments. Thoracic shear forces were influenced by body shape during dynamic flexion (up to 92%) and moderately or not at all (0-45%) at upright posture.

Fig 2. Relative effect of sagittal alignment (yellow) and body shape, i.e. trunk mass distribution (purple), on spinal segmental compression forces in upright standing.



**Result**: The results of this study demonstrate the impact of body shape on ASD biomechanics. While it does not substantially influence overall sagittal balance (trunk CoM), it should be confirmed in future analysis of patient-specific (age, sex, BMI) body shapes. Nevertheless, the profound effect of body shape on spinal loads suggests it should be considered in surgical planning to avoid mechanical overloading of spinal segments prone to complications at the proximal junction.

**Keywords**: Adult Spinal Deformity (ASD), Trunk center of mass (CoM), Spinal loads, Sagittal alignment, Musculoskeletal model

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# **Ref No: 7757**

#### THE EFFECT OF ALENDRONATE AND VITAMIN D COMBINATION ON FRACTURE HEALING AND NEW FRACTURE DEVELOPMENT IN OSTEOPOROTIC VERTEBRAL FRACTURES: IS IT EFFECTIVE? CAN IT PREVENT?

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**Aim**: This study aimed to evaluate the effects of combined Alendronate and Vitamin D therapy on fracture healing, pain, functional outcomes, quality of life, and new fracture incidence in patients with osteoporotic vertebral compression fractures (OVCF) and concurrent vitamin D deficiency.

**Material and Method**: Between January 2019 and December 2022, 371 patients diagnosed with OVCF and confirmed vitamin D deficiency were retrospectively analyzed. Patients were divided into two groups: Group A (n=156), treated with Alendronate and Vitamin D, and Group B (n=215), who received no anti-osteoporotic treatment. All patients were followed for an average of 40 months. Fracture healing time, pain (VAS), functional status (ODI, RMDQ), quality of life (SF-36), and new fracture occurrence were evaluated clinically and radiologically at 3, 6, 12, 24, and 36 months.

**Findings**: There were no significant differences between the groups regarding age, gender, and fracture level in terms of basic demographic and clinical characteristics. The mean fracture healing time was calculated as  $3.2 \pm 1.1$  months in Group A and  $3.4 \pm 1.3$  months in Group B, and this difference was not statistically significant (p=0.278). Pain levels were lower in Group A during the first 6 months; however, this difference was not statistically significant. In both groups, a marked reduction in pain levels was observed over time. Functional scores (ODI, RMDQ) and quality of life (SF-36) significantly improved over time in both groups, but there was no statistically significant difference between the groups regarding these improvements.

Throughout the follow-up period, new fractures occurred in 7.7% of patients in Group A and 8.3% of patients in Group B, with no statistically significant difference between the groups (p=0.742).

Demographic and Baseline Characteristics

Parameter	Group A (Treat- ment)	Group B (Control)	p-value
Age (years)	72.8 ± 8.1	71.9 ± 8.9	0.412
Female/Male (n)	104/52	137/78	-
Baseline VAS	7.6 ± 1.4	7.4 ± 1.3	0.278
Baseline Vitamin D (ng/mL)	14.8 ± 8.2	15.2 ± 7.9	0.521
Baseline ODI	26.8 ± 9.8	25.9 ± 10.4	0.582
Baseline RMDQ	14.6 ± 5.3	13.8 ± 5.7	0.418
Baseline SF-36 PCS	19.1 ± 16.8	20.3 ± 17.4	0.634
Baseline SF-36 MCS	28.1 ± 21.3	26.7 ± 22.1	0.512

Clinical and Follow-up Results (VAS, ODI, RMDQ, SF-36, and Fracture Healing Time)

Parameter	Group A (Treat- ment)	Group B (Control)	p-value
Fracture Healing Time (months)	3.2 ± 1.1	3.4 ± 1.3	0.278
VAS (3rd month)	4.2 ± 1.7	4.8 ± 1.9	0.091
VAS (6th month)	3.1 ± 1.4	3.6 ± 1.5	0.087
VAS (12th month)	2.1 ± 1.1	2.3 ± 1.2	0.298
VAS (24th month)	1.9 ± 1.0	2.0 ± 1.1	0.512
VAS (36th month)	1.8 ± 0.9	1.9 ± 1.0	0.478
ODI (Baseline)	26.8 ± 9.8	25.9 ± 10.4	0.582
ODI (6th month)	18.3 ± 8.1	19.6 ± 9.5	0.144
ODI (12th month)	14.6 ± 7.4	15.2 ± 8.3	0.144
ODI (24th month)	12.4 ± 6.8	13.1 ± 7.2	0.188
ODI (36th month)	11.2 ± 6.4	12.3 ± 6.9	0.203
RMDQ (Baseline)	14.6 ± 5.3	13.8 ± 5.7	0.418
RMDQ (6th month)	9.4 ± 4.7	10.1 ± 5.1	0.194
RMDQ (12th month)	6.8 ± 4.2	7.4 ± 4.8	0.194
RMDQ (24th month)	5.6 ± 3.9	6.4 ± 4.3	0.229
RMDQ (36th month)	5.1 ± 3.5	5.8 ± 4.0	0.242
SF-36 PCS (Base- line)	19.1 ± 16.8	20.3 ± 17.4	0.634

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Parameter	Group A (Treat- ment)	Group B (Control)	p-value
SF-36 PCS (12th month)	33.2 ± 18.7	34.5 ± 19.6	0.934
SF-36 PCS (24th month)	35.4 ± 19.1	36.1 ± 20.5	0.921
SF-36 PCS (36th month)	36.8 ± 20.2	37.4 ± 21.0	0.887
SF-36 MCS (Base- line)	28.1 ± 21.3	26.7 ± 22.1	0.512
SF-36 MCS (12th month)	44.8 ± 19.5	42.5 ± 20.3	0.093
SF-36 MCS (24th month)	46.3 ± 20.0	43.8 ± 21.1	0.084
SF-36 MCS (36th month)	47.1 ± 20.4	44.2 ± 21.8	0.076

Table 2

New Fracture Development by Follow-Up Period

Follow-Up Period	Group A (Treat- ment)	Group B (Cont- rol)	p-va- lue
6th Month	2 (1.3%)	3 (1.4%)	0.912
12th Month	4 (2.6%)	5 (2.3%)	0.841
24th Month	3 (1.9%)	5 (2.3%)	0.774
36th Month	3 (1.9%)	5 (2.3%)	0.711
Total	12 (7.7%)	18 (8.3%)	0.742

Table 3

**Result**: The combination of Alendronate and Vitamin D provided limited short-term pain reduction in patients with osteoporotic vertebral compression fractures and vitamin D deficiency; however, it was insufficient in improving long-term fracture healing, functional recovery, and preventing new fractures. Although a reduction in pain was observed in the early period, this effect diminished over time, and no significant difference was found between treated and untreated groups in the long term. Furthermore, the similar rates of new fractures in both groups indicate that current treatment approaches remain inadequate to prevent subsequent fractures.

**Keywords**: Osteoporotic fracture, Vertebra, Alendronate, Vitamin D, New fracture

# Ref No: 7762

#### UNDERSTANDING BILATERAL MEP CHANGES DURING CORD LEVEL SPINAL DEFORMITY SURGERY: ETIOLOGY, SIGNIFICANCE AND RESPONSE

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**Aim**: Cord-level deformity surgery carries a risk of neurologic injury. Intraoperative neurophysiologic monitoring (IONM) can help reduce the risk of neurologic deterioration and detect intraoperative injuries. This study aims to enhance our understanding of bilateral MEP alerts that occur during cordlevel deformity surgery.

**Material and Method**: 20 international centers prospectively documented IONM (EMG, SSEP, MEP), demographics, radiographs, and surgical events of patients undergoing deformity correction for a major Cobb >80° or involving a cord-

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level osteotomy. This study is a descriptive analysis of patients who experienced bilateral MEP alerts. Alerts were classified into MEP-only or MEP associated with SSEP (MEP+SSEP). Alerts were defined as a  $\geq$ 50% loss of amplitude from baseline. Surgical (exposure, implant placement, osteotomy, correction/ rod placement, traction) and nonsurgical (systemic, anesthesia, technical) events preceding the alert were recorded. The relationship between alerts with traumatic preceding events was assessed.

Findings: Of 349 cord-level deformity surgeries (age: 10-80 years), 25 patients (7%) experienced 34 bilateral MEP alerts. Of the 34 alerts, 19 (56%) were associated with only surgical events, 9 (26%) with only non-surgical events, and 6 (18%) with both. 85% (29/34) of the bilateral MEP alerts were MEPonly. 76% (22/29) of the time a surgical event preceded the bilateral MEP-only alert. Correction/rod insertion was the most common surgical event preceding the alert (73%, 16/22), followed by traumatic event (5/22) and other (3/22). A surgical event preceded the MEP+SSEP alert 60% (3/5) of the time. All (3/3) MEP+SSEP alerts with surgical events occurred after a traumatic event. 80% (20/25) of bilateral MEP alerts with surgical events had bilateral recovery at closure. 88% (7/8) of alerts after traumatic events demonstrated bilateral recovery. The recovery rate for alerts after non-traumatic events was 76% (13/17). Among patients with bilateral MEP alerts, 20% (5/25) developed a neurological deficit after surgery (3/20 in the MEPonly group and 2/5 in the MEP+SSEP group). By discharge, 8% (2/25) had a neurological deficit in the MEP-only group, and 0% in the MEP+SSEP group.

**Result**: Bilateral MEP changes during cord-level deformity surgery occur infrequently and are most often related to surgical events. When MEP alerts occur in isolation, they are more commonly associated with correction maneuvers and rod insertion, potentially indicating an ischemic event to the spinal cord. In contrast, MEP changes accompanied by SSEP alterations after a surgical event are typically linked to more traumatic events. Alerts after traumatic surgical events have higher rates of bilateral intraoperative recovery compared to alerts after non-traumatic surgical events.

**Keywords**: Cord-level spinal deformity surgery, MEP alerts, Neurological deficit, Intraoperative neurophysiologic monitoring (IONM)

# Ref No: 7896

#### EXPLORING THE LANDSCAPE OF TORTICOLLIS RESEARCH: TRENDS, INNOVATIONS, AND GLOBAL INSIGHTS

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**Aim**: Torticollis is a condition characterized by involuntary contraction of the cervical muscles, causing an abnormal head posture. It can be congenital, most commonly due to fibrosis of the sternocleidomastoid muscle, or acquired from various causes such as trauma, infections, or neurological disorders. Despite its high prevalence, particularly in children, the exact pathophysiology remains unclear, requiring further investigation into diagnosis and treatment strategies. This study aims to analyze the research landscape of torticollis through bibliometric analysis, identifying publication trends, key contributors, influential journals, and emerging research themes.

**Material and Method**: A bibliometric analysis was conducted using the Web of Science Core Collection, covering articles and reviews published between 2000 and 2024. VOSviewer, Bibliometrix, and CiteSpace were utilized to visualize coauthorship networks, keyword co-occurrence, and citation relationships.

**Findings**: A total of 2.324 relevant articles were identified, with 1,922 being original research papers and 297 review articles. Publication trends revealed a significant increase in research output between 2010 and 2021, peaking in 2021, followed by a decline. The United States led in publication volume (633 articles) and global collaborations, followed by Germany, China, and the United Kingdom. Key contributors in the field included H.A. Jinnah (43 articles), J. Jankovic (32), and K.P. Bhatia (22). The most cited articles focused on cervical dystonia, congenital muscular torticollis, and botulinum toxin treatments. "Movement Disorders" was the most influential journal, with 111 articles and 4,676 citations, emphasizing the neurological aspects of torticollis. Keyword analysis revealed evolving research interests. Early studies emphasized "spasmodic torticollis," "botulinum toxin," and "movement disorders," whereas recent trends have shifted towards "physical therapy," "clinical guidelines," and "congenital muscular torticollis," indicating an increasing



focus on pediatric management. Co-citation analysis identified two major research clusters: one focusing on neurological mechanisms and dystonia treatment and another on pediatric and orthopedic perspectives, particularly in congenital cases.

**Result**: Torticollis research has seen significant growth over the past two decades, with increasing interdisciplinary contributions. The shift towards non-invasive diagnostics and rehabilitation-based management, particularly in pediatric torticollis, highlights emerging treatment paradigms. Future research should focus on optimizing treatment protocols and fostering global collaborations to enhance clinical outcomes.

**Keywords**: congenital muscular torticollis, bibliometric analysis, cervical dystonia, movement disorders, physiotherapy

between 17-83). The levels of LDH and their distribution among genders are shown in table 1. Side of the LDH and levels of the herniations are shown in table 2. Recurrence is observed in 58 patients (7,5%). The high incidence of history of heavy working and obesity in this group was significant. Also, 27 out 43 patients with cephalated herniation had recurrences which was also notable. Dural tear was detected in 3 (0,4%). All dural tears are repaired with primary closure as well as dural patches. In 5 patients, spondilodiscitis developed after three weeks of the operation. These patients were administered two-agents wide spectrum antibiotics for 6-8 weeks. All symptoms subsequently resolved with the medications. One female patient that was operated for left L3-4 disc herniation has died at the 8th day of the operation due to thoracic aorta rupture.

Level of lumbar disc herniation and gender distrubution

Level	Male	Female	Total
L2-3	5	3	8 (%1)
L3-4	19	14	33 (%4.2)
L4-5	194	225	419 (%54.2)
L5-S1	153	159	312 (%40.4)
Total	371 (%48.05)	401 (51.95)	772 (%100)

Table 1

Sides of disk herniations

Side and Level	Male	Female	Total
R L2-3	2	2	4
L L2-3	3	1	4
R L3-4	7	6	13
L L3-4	12	8	20
R L4-5	79	97	176 (%22.8)
L L4-5	115	128	233 (%30.2)
R L5-S1	74	86	160 (%20.7)
L L5-S1	79	73	152 (%19.7)
Total	371	401	772 (%100)

Table 2

## Ref No: 7960

#### SURGICAL EXPERIENCE AND COMPLICATIONS IN 859 PATIENTS TREATED WITH MICRODISCECTOMY FOR LUMBAR DISC HERNIATION: SINGLE CENTER, SINGLE SURGEON

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**Aim**: Our purpose in this study is to present the experience of microdiscectomy in a single center with the same surgeon performing the operations. We want to discuss our results and compare them with literature.

**Material and Method**: 772 patients have been operated for single level lumbar disc herniations(LDH) between 2015-2024. Patients whose physical examination findings and pain didn't impove after proper medication and physiotherapy with positive single level lumbar disc herniation Magnetic Resonance Images(MRI) are included in the study. All patients are operated under spinal anesthesia.

Findings: The study group consisted of 371 males ( 48%) and 401 females (52 %). The median age was 47 ( ranging



Recurrences of disc herniations

Levels	Male	Female	Total
L2-3	1	0	1
L4-5	15	11	26
L5-S1	19	12	31
Total	35	23	58

Table 3

**Result**: Our results revealed similar gender distribution amongs genders. Heavy working history and obesity seem to be risk factors for recurrence of lumbar disc herniations. Cephalated disc herniations are prone to instability of the spine. Due to this risk, one should keep in mind that these patients may require stabilisation surgeries in the rest of their lives.

Keywords: disc herniation, recurrence, complications

of the patients who remained at T3 developed PJK. The patients who underwent revision were given a TLSO hyperextension brace for 3 months post-op.

**Result**: Osteoporotic spinal stenosis treatment is a difficult disease. If a rigid fusion such as iliac fusion is preferred in patients, the possibility of PJK development is quite high. For this reason, although it is recommended in the literature to stay in the rib T9, T8 vertebrae, this PJK development was observed in 8 of the 13 patients we performed in the clinic. Our recommendation is to raise the proximal level up to T3 in patients who have undergone iliac fusion if the general condition of the patient is suitable.

**Keywords**: proksimal junctional kyphosis, spinal stenosis

#### **Ref No: 8052**

#### LEVEL PREFERENCE TO PREVENT PJK DEVELOPMENT IN PATIENTS UNDERGOING ILIAC FUSION

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**Aim**: The aim of the study is to determine the appropriate proximal level to prevent the development of PJK and to prevent possible complications if iliac fusion is to be performed in patients with spinal stenosis.

**Material and Method**: Twenty patients over the age of 65 who underwent iliac fusion between 2018 and 2025 were included in the study. Proximal level T10 was performed in 6 of the patients, T8 in 7 patients and T3 in 7patients. Patients with preoperative BMD scores between -2 and 3 were included in the study. All patients underwent laminectomy. No patient underwent interbody fusion.

**Findings**: In 4 out of 6 patients who remained at T10, PJK developed in 4 out of 7 patients who remained at T8. The patients were taken to surgery again and went up to T3. None

## Ref No: 8243

#### DOES PEDICLE SCREW LENGTH AT FRACTURE LEVEL AFFECT MECHANICAL STABILITY IN SHORT SEGMENT POSTERIOR FIXATION ON THORACOLUMBAR FRACTURES? A BIOMECHANICAL STUDY

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**Aim**: Pedicle screw placement at the fracture level improves stability in thoracolumbar fractures treated with short segment posterior instrumentation. However, the optimal screw length remains unclear. Excessively long screws may pose risks such

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as damaging anterior structures or impeding fracture healing. To evaluate the biomechanical effects of pedicle screw length at the fracture level in short segment posterior instrumentation of thoracolumbar fractures.

**Material and Method**: Twenty-one fresh sheep thoracolumbar spines were randomly divided into three groups. Unstable L1 fractures were simulated using a falling weight model. Group 1 underwent short-segment posterior instrumentation without an intermediate screw. Group 2 included screws  $\leq 50\%$  of the vertebral body length (20 mm), while Group 3 utilized screws  $\geq 70\%$  of the body length (35 mm). Mechanical stability was assessed under axial loading, flexion/extension, lateral bending, and axial rotation using an electromechanical actuator. Statistical analyses were conducted with the Shapiro-Wilk, Kruskal-Wallis, Mann-Whitney U, and Wilcoxon Signed Rank test.

**Findings**: Incorporating a pedicle screw at the fracture level significantly enhanced stability across all movement directions compared to conventional short-segment instrumentation. However, there were no significant differences in mechanical stability between short and long screws under axial loading, flexion/extension, lateral bending, or axial rotation (Group 1 < Group 2 = Group 3).

**Result**: Adding a pedicle screw at the fracture level increases the mechanical stability of short-segment posterior instrumentation. As reported in the literature, excessively long pedicle screws may pose risks such as damage to anterior structures, including blood vessels and organs. Since shorter pedicle screws at the fracture level provide comparable stability to longer screws, their use offers additional advantages, such as minimizing the risk of displacement of the anterior fracture fragment and reducing potential interference with fracture healing, along with the disadvantages mentioned above.

**Keywords**: Thoracolumbar fractures, Short-segment instrumentation, Pedicle screw length, Biomechanical stability

# Ref No: 8249

#### TOWARDS VERTEBRAL BODY TETHERING TERMINOLOGY CONSENSUS – A FRAMEWORK FOR UNIFIED REPORTING OF OUTCOMES AND COMPLICATIONS

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**Aim**: Vertebral Body Tethering is a relatively new technique. Existing literature comprises heterogeneity in regards to terminology around this procedure as well as several unclear definitions. This study aimed to convey a systematic approach of describing and defining terminology that has a global acceptance.

**Material and Method**: A workgroup of 22 members from 2 multi-center research groups was formed, who developed a preliminary conceptual framework of the consensus items. Next, a modified Delphi process incorporating face-to-face meetings and online surveys was conducted by the project team consisting of 2 spine surgeons and a project manager supported by a methodologist. A total of 58 panelists, including VBT and

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non-VBT experts, were recruited. In each round, a series of "Yes/ No" questions were provided, and experts were encouraged to provide free-text feedback. After each round, the project team analyzed the data and prepared feedback reports and discussion guides. A 7-round iterative process was continued until >95% consensus was reached.

**Findings**: Overall, 106 items were covered, of which, 89 have reached consensus and 17 were rejected. Under 6 main headings (Surgical approach, Surgical technique, Orientation of implants, Name of the material, Measurements & Growth, and Name of the procedure) and 24 subheadings, a total of 60 terms were agreed upon.

**Result**: Given the high threshold for consensus, this study provides a globally acceptable terminology that will clarify and unify VBT outcomes reporting in scientific presentations and publications. Standardization in the description of surgical approaches and techniques in VBT will allow clinicians to all 'speak the same language'.

Examples of agreed upon terminology



**Keywords**: Vertebral Body Tethering (VBT), Surgical approach, Multi-center research, Spine surgery terminology, Terminology standardization

# Ref No: 8276

# MAGEC ROD SURGERY WITH 55 PATIENTS: OUR 3-YEAR CLINICAL SERIES

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**Aim**: Although traditional Growing Rods (TGRT) are frequently used in progressive early-onset scoliosis, it is necessary to perform an extension surgery every 6 months. However, with the Magec Rod method introduced in the last 15 years, the number of such planned operations has been reduced, as extension can be performed under outpatient clinic conditions. In this way, the Magec Rod system has gained considerable success. As Ankara Bilkent City Hospital, we aimed to inform you about 55 patients on whom we performed Magec Rod surgery in a 3-year period.

**Material and Method**: We retrospectively examined our complication and revision rates in 55 Magec Rod patients who underwent surgery between 2021-2024.

Findings: Of the total of 55 patients, 22 were male and 33 were female. The youngest was 3 years old, the oldest was 10 years old, and the average age was 7.8 years. A total of 33 patients underwent revision surgery. Of these, 7 were operated on at an external center and then underwent revision surgery in our clinic (external revision). In 24, the first surgery was performed in our clinic and the revision surgery was performed in our clinic again (internal revision). Of the external revision surgeries, 4 were planned revisions and 3 were unplanned revisions. In the internal revisions, 16 were planned revisions and 8 were unplanned revisions due to various complications. Of these patients, 5 were revisions due to wound opening and infection, 1 due to rod fracture, 1 due to screw pull-out, and 1 due to both wound and screw pull-out. In addition, of those who underwent revision due to wound opening, 1 underwent a total of 5 revisions, 1 underwent a total of 2 revisions, and 2 had their Magec Rods removed. 3 patients were not revised despite the wound opening, 2 underwent planned revision when the time came due to improvement in follow-ups, and 1 is still being followed without revision. A total of 9 patients underwent final surgery, 2 did not undergo any revision surgery. 5 underwent unplanned revision first, then final surgery, and 2 underwent planned revision first and then final surgery.

**Result**: Magec Rod offers an effective and safe alternative in the treatment of early-onset scoliosis. Although it is a successful treatment option, the treatment process should be managed carefully, considering complications and revisions. Longer-term studies will better evaluate the effectiveness and safety of the system.

Keywords: Early-onset scoliosis, Magec Rod.

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## Ref No: 8335

#### EVALUATION OF THE ACUTE CORRECTIVE EFFECT OF INDIVIDUALIZED SCOLIOSIS BRACES PRODUCED USING 3D IMAGING TECHNOLOGY ON COBB ANGLE

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<sup>1</sup>Sancaktepe Prof.Dr.Ilhan Varank Training and Research Hospital <sup>2</sup>Özgür Karakoyun Private Office

**Aim**: This study aims to evaluate the acute corrective effect of individualized braces produced with three-dimensional (3D) imaging and computer-aided design (CAD/CAM) technology on Cobb angle in individuals diagnosed with Adolescent Idiopathic Scoliosis (AIS).

**Material and Method**: In this retrospective study conducted between 2022 and 2023, 55 AIS patients (45 girls, 10 boys) with a Cobb angle between 20°-45° were included. Each patient underwent 3D body scanning and orthorontgenography and CAD-assisted customized TLSO braces were designed. Cobb angles were compared with X-ray images taken before and after brace application. In statistical analysis, paired samples t-test was applied and significance level was accepted as p<0.05.

**Findings**: Cobb angles in the thoracic, thoracolumbar and lumbar regions decreased significantly after bracing (mean correction rates 71.86%, 85.49% and 70.60%, respectively; p<0.001). The highest correction was observed in the thoracolumbar region

**Result**: Individualized braces produced with 3D imaging and CAD/CAM technology provide a high level of acute corrective effect on the Cobb angle in the treatment of AIS. This method can be considered as a modern and effective alternative in the conservative treatment of scoliosis.

**Keywords**: Adolescent Idiopathic Scoliosis, Cobb Angle, 3D Imaging, CAD/CAM, TLSO, Brace Treatment

# Ref No: 8337

### RETURN- TO- WORK TIME WHO UNDERWENT SINGLE-LEVEL LUMBAR DISC HERNIATION

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<sup>1</sup>Bilkent City Hospital

**Aim**: This retrospective study analyzed 163 patients who underwent single-level lumbar disc herniation (LDH) surgery to evaluate demographic, clinical, and occupational factors influencing postoperative outcomes. The cohort comprised 58.3% males (n=95) and 41.7\% females (n=68), with a mean age of 44.8±9.7 years. L4-5 herniations were most frequent (44.2%, n=72), followed by L5-S1 (25.1%, n=41). Preoperative pain scores (VAS:  $8.1\pm1.2$ ) significantly improved postoperatively (VAS:  $1.9\pm1.3$ , p<0.001), with no significant differences across herniation levels (p=0.12).

**Material and Method**: Return-to-work (RTW) time averaged 45.7 $\pm$ 16.8 days for females and 43.1 $\pm$ 14.5 days for males (p=0.08). Stratified by herniation level, RTW times were comparable (L1-2: 47.5 $\pm$ 18.1 days; L5-S1: 44.2 $\pm$ 15.8 days, p=0.21). Manual workers (61.4%, n=100) had longer RTW times (46.0 $\pm$ 16.7 days) compared to high-grade (44.8 $\pm$ 16.2 days) and low-grade non-manual workers (45.1 $\pm$ 15.9 days), though not statistically significant (p=0.15).

**Findings**: Self-efficacy (RTWE-SE-19) scores differed significantly by occupation (p=0.02), with manual workers scoring lowest ( $6.4\pm1.7$  vs.  $7.0\pm1.4$  in high-grade non-manual). Hospital stays averaged  $2.5\pm1.2$  days, with no correlations to herniation level or gender (p>0.05).



#### Patient characteristics

		n	%
		Mean ± SD	Median (Min - Max)
	L1-2	12	7,4 %
	L2-3	18	11%
Surgery Level <sup>a</sup>	L3-4	20	12,3%
	L4-5	72	44,2%
	L5-S1	41	25,1%
Cumpany Cidas	Right	98	60,1%
Surgery Side <sup>®</sup>	Left	65	39,9%
0 1 0	Female	68	41,7%
Gender <sup>a</sup>	Male	95	58,3%
Age (yerars) <sup>b</sup>		44,8±9,7	45 (22-65)
MAC b	Preop	8.1±1,2	8 (5-10)
VA5 °	Postop	1,9±1,3	1 (1-6)
RTW Time (Days)	Female	46,2±16,8	45 (15-120)
According to Gender <sup>b</sup>	Male	43,1±14,5	45 (15-90)
	L1-2	47,5±18,1	45 (15-90)
RTW Time	L2-3	46,0±17,3	45 (15-60)
(Days)	L3-4	45,8±16,9	45 (30-60)
Level <sup>b</sup>	L4-5	45,5±16,5	45 (15-120)
	L5-S1	44,2±15,8	45 (30-120)
Occuration	High Grade non-manual	38	23,3%
(According to	Low Grade	25	15,3%
1000)	Manual	100	61,4%
Hospital Stay <sup>b</sup>		2,5 ± 1,2	2,0 (1,0 - 5,0)
	High Grade		
	non-manual	7,0±1,4	7,2 (3,4-9)
RTWE-SE-19 b	Low Grade non-manual	6,9±1,5	7 (3-8,5)
	Manual	6,4±1,7	6,8 (2-9)

a: n / %, b: mean ± SD / Median (Min-Max), SD: Standard Deviation, VAS: Visual analog scale, RTW: Return to work, ISCO: International Standard Classification of Occupations, RTWE-SE-19: The Return-to-Work Self-efficacy Questionnaire

**Result**: While LDH level did not significantly impact RTW time or pain relief, occupational class influenced self-efficacy, suggesting tailored rehabilitation for manual workers may improve outcomes. Gender disparities in RTW times, though marginal, warrant further investigation.

**Keywords**: Lumbar Disc Herniation, Return to Work, Surgical Outcomes, Self-Efficacy, Occupational Health

## **Ref No: 8493**

#### "DR.AI WILL SEE YOU FIRST": EVALUATING GPT-4.5 AS AN AI ASSISTANT IN SPINE SURGERY OUTPATIENT CLINICAL DECISION-MAKING

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**Aim**: The objective of this study was to evaluate the feasibility, accuracy and effectiveness of the Generative Pretrained Transformer 4.5 (GPT-4.5) artificial intelligence model as a clinical decision-support assistant in outpatient spine surgery settings. Specifically, the study aimed to assess the model's capacity for structured clinical questioning, accurate diagnostic reasoning, appropriateness of recommended diagnostic evaluations, effective identification of clinical "red flags," and its ability to maintain a professional tone throughout its interaction with patient.

**Material and Method**: Twenty-two constructed clinical scenarios were created, representing a wide spectrum of spine surgeryrelated pathologies, and were stratified according to diagnostic complexity into Simple (n=6), Moderate (n=6), and Complex (n=10) cases. Firstly, model was systematically optimized using prompt engineering techniques including Role Prompting ("You are GPT-Spine, an AI assistant supporting spine surgeons"),

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#### Initial Prompt Engineering

#### Prompt:

"You are GPT-Spine, an AI-powered clinical assistant specifically designed to support spine surgeons in an outpatient spine surgery clinic. Your primary role is to gather structured clinical information from patients through a step-by-step approach.

Start the consultation by introducing yourself professionally, clearly stating that your role is to collect preliminary medical information to assist the surgeon, who will subsequently conduct a detailed evaluation. Assure the patient that their information is handled confidentially and emphasize that final clinical decisions will be made by the surgeon.

When obtaining the patient's medical history, please ask about demographics (age, gender, occupation), detailed past medical history, and the specific reason for their visit. Address patient complaints individually, systematically inquiring about symptom onset, duration, severity, precise location, and radiation patterns. Ensure you pose relevant follow-up questions based on the patient's responses (e.g., if the patient mentions reduced walking capacity, inquire specifically if leaning forward affects their pain).

Maintain a professional, respectful, and reassuring tone throughout the interaction

Always carefully evaluate patient responses for potential clinical red flags indicating urgent conditions such as malignancy, acute/progressive neurological deficits, or infections. If you identify any red flags, clearly document and highlight them.

Once you have gathered sufficient preliminary information, politely inform the patient that the initial assessment is complete and that the surgeon will see them shortly.

Please confirm that you clearly understand your role. Once confirmed, wait for the patient to enter their full name and surname before starting the consultation."

D 6 7 0 10 1

GPT-4.5 was specifically engineered by various prompting techniques to take a complete history and perform diagnostic approach

Example of Model-Patient Interaction

#### Spine Clinic AI Assistant – Patient Mode

Hello, and welcome to our spine clinic!

My name is Dr. Al, and I am here to assist with your consultation. My role is to gather essential information about your symptoms and medical history before you see the spine surgeon. This will help ensure that your visit is as efficient and focused as possible.

urkishspine

Rest assured, after our discussion, a qualified surgeon will examine you thoroughly. I will ask you questions one at a time to document your concerns accurately.

Let's begin.

Can you please provide your full name?

		David Beckham
Thank you, Mr. Beckham.		
To begin, I need some basic information.		
How old are you, and what is your occupation	?	
0 6 9 0 %		
		45, retired soccer player
	$\checkmark$	
Herhangi bir şey sor		
+		$\textcircled{\begin{tabular}{c} \hline \hline \\ \hline \end{array}}$

#### Example of Model-Patient Interaction

**Findings**: GPT-4.5 demonstrated consistently high performance. Overall mean scores were: follow-up questioning:4.70 (ICC=0.92),understanding patient complaints: 4.75 (ICC=0.94),accurate diagnosis: 4.70 (ICC=0.91),diagnostic recommendations: 4.65 (ICC=0.90),identification of red flags: 4.75 (ICC=0.93),professional communication:4.80 (ICC=0.94).Performance by complexity level was evaluated as simple scenarios: scores 4.65-4.85, ICC 0.90–0.93; moderate complexity scenarios: scores 4.65-4.75, ICC 0.88–0.93; complex scenarios: scores 4.60-4.80, ICC 0.88–0.92. GPT-4.5 maintained high-level performance across varying scenario complexities with good-to-excellent inter-rater reliability.

**Result**: GPT-4.5 demonstrated robust capability as a clinical decision-support assistant in spine surgery outpatient settings, aiding clinicians by accurately assessing patient scenarios, identifying critical clinical indicators and maintaining professional interactions. Ethical considerations highlight that GPT-4.5 must serve strictly as a supportive tool; inal clinical judgments must always be made by a clinician. Integrating radiological imaging reports or imaging data in future studies could further enhance GPT-4.5's diagnostic accuracy and practical utility.

**Keywords**: artificial intelligent, spine surgery, outpatient, GPT-4.5, ChatGPT

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## **Ref No: 8642**

#### EVALUATING THE GEOMETRIC ACCURACY OF SPINAL ALIGNMENT MODELS WITH VARYING LEVELS OF INDIVIDUALIZATION

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**Aim**: Spinal alignment significantly affects spinal loads, emphasizing the need for personalized posture in musculoskeletal modeling, especially for clinical use. Current clinical methods rely on regional measurements and assume uniform curvature distribution across spinal segments. However, neglecting individual segment alignment can lead to inaccurate reconstructions and load predictions. This study aims to assess the geometric accuracy of spinal alignment reconstruction methods with varying individualization levels.

**Material and Method**: A novel articulated thoracolumbar spine model (AnyBody v.8) was applied to 598 adult spinal deformity patients (age: 52.6±21.0 years, Male/Female: 0.23). This dataset provided vertebral body annotations and regional alignment measures to model spinal alignment using three methods: 1. Regional Measures: Sacrum and pelvic orientations were defined by sacral slope (SS), pelvic incidence (PI), pelvic tilt (PT) in the sagittal plane, and pelvic obliquity (PO) in the coronal plane. L4-S1, L1-S1, T10-L2, T5-T12, and T2-T5 angles set vertebrae orientations. The main thoracic (MT), thoracolumbar-lumbar (TLL), and lumbosacral (LS) Cobb angles were applied in the coronal plane. These measures were distributed equally across intervertebral joints. 2. Vertebral Inclinations: Individual vertebral inclinations were considered in both sagittal and coronal planes. 3. Vertebral Inclinations & Centroid Positions: This method also included centroid positions of each vertebral body (Figure 1). For each method, two simulations were performed: (S1,2,3) sagittal-only and (SC1,2,3) including both sagittal and coronal alignment. Inverse-static simulations of upright standing were conducted, and accuracy was analyzed by deviations from actual patient alignment in anteroposterior (AP), craniocaudal (CC), sagittal vertebral inclinations, and mediolateral (ML) centroid positions.

Fig 1: Set of input parameters for each patient-specific spinal alignment modelling method.





**Findings**: Differences in vertebral centroid positions across alignment reconstruction methods ranged from negligible to substantial, depending on the patient, spinal level, and axis direction. Using the S1 method, centroid deviations ranged from  $\pm 6$  cm in the AP direction, -13 cm to 7 cm in the CC direction, and -17 cm to 12 cm in the ML direction, relative to SC3. Vertebral inclinations showed a maximal deviation of  $\pm 20^{\circ}$  at all spinal levels. The most significant geometric deviations occurred at the T1 level (Figures 2&3), with centroid positioning errors reaching up to 15 cm, not mitigated by accounting for individual vertebral orientations (S2, SC2). However, errors decreased in the AP direction.

Fig 2: Sagittal (left), and sagittal and coronal (right) vertebral inclination errors of T1 across the six spinal alignment reconstruction methods



Each point represents the inclination of T1 relative to the horizontal for an individual patient. The spread of data illustrates the variability in inclination errors among methods.

Fig 3: T1 Vertebral centroid positional error across all six MSK model calibration methods, calculated relative to radiological annotations in antero-posterior (AP), cranial-caudal (CC) and medio-lateral (ML) directions.



**Result**: Simplified methods for modeling spinal alignment can introduce significant errors in estimating vertebral position and orientation, failing to accurately reflect the patient's posture. Given the critical impact of spinal alignment on biomechanical loads, using the most detailed method ensures reliable musculoskeletal modeling outcomes.

**Keywords**: Spinal alignment, Alignment reconstruction methods, Vertebral centroid positions, Adult spinal deformity, Musculoskeletal Modeling

#### **Ref No: 8732**

# INVESTIGATION OF MORPHOLOGICAL DIFFERENCES IN THE L5-S1 VERTEBRAL SEGMENT

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**Aim**: This study aims to evaluate sacral morphological variations in the population, mainly focusing on the S1 vertebra, which is clinically significant in ilio-sacral screwing and posterior instrumentation. Additionally, sacralization and lumbarization of the L5-S1 segment were assessed.

**Material and Method**: A retrospective review was conducted on lower abdominal and pelvic computed tomography (CT) scans from two centers over one year (January – December 2024). Of 4,224 examinations, 10% were randomly selected using computer-generated randomization. Patients younger than 20 or older than 80 years and those with pelvic fractures, spinal or pelvic instrumentation, bone metastases, or neoplasms were excluded, yielding 352 examinations. Age, gender, and age groups were recorded. S1 morphology was categorized as ascending, descending, horizontal, or dysmorphic, according to Goetzen et al. [Figure 1]. The presence of sacralization or lumbarization in the L5-S1 segment was also documented. Statistical analyses

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included the Shapiro-Wilk test for normality, the Kruskal-Wallis test for continuous variables, the Chi-square test for categorical data, and Spearman's correlation for intergroup relationships.

**Findings**: The study included 215 females (61.1%) and 137 males (38.9%), with a mean age of  $43.58 \pm 14.65$  years (range: 20–79). The age distribution was 39.78% for 20–39 years, 47.73% for 40–59 years, and 12.5% for 60–79 years. S1 morphology was classified as ascending in 23.58%, descending in 6.25%, horizontal in 48.01%, and dysmorphic in 22.16%. The L5-S1 segment was regular at 80.4%, while sacralization and lumbarization were 17.9% and 1.7%, respectively. No significant difference or correlation was found between S1 morphology and age (p=0.246, p=0.393), gender (p=0.194, p=0.685), or age groups (p=0.482, p=0.353). Similarly, sacralization/lumbarization showed no significant association with S1 morphology (p=0.332).

Classification of S1 morphology



Ascending type (a), horizontal type (b), descending type (c).

**Result**: This study highlights the substantial variability in S1 morphology. Using standard fluoroscopic imaging during iliosacral fixation, horizontal and descending types, which facilitate screw placement, accounted for 54.26%, while ascending and dysmorphic types, which pose challenges, comprised 45.74%. Independent of S1 morphology, sacralization/lumbarization was present in 19.6%. These findings emphasize the importance of detailed multiplanar reconstruction imaging before clinical interventions to ensure accurate assessment and optimal surgical planning.

**Keywords**: Iliosacral screw placement, S1 morphological variations, Sacralization and lumbarization, Surgical planning

# Ref No: 8933

#### UNILATERAL BIPORTAL ENDOSCOPIC DECOMPRESSION SURGERY IN SINGLE LEVEL LUMBAR SPINAL STENOSIS: LEARNING CURVE AND EFFECTS ON OUTCOMES

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**Aim**: The aim of this study was to evaluate the learning curve and its impact on surgical outcomes of lumbar unilateral biportal endoscopic (UBE) decompression performed by a single surgeon in lumbar spinal stenosis (LSS).

Material and Method: A total of 98 patients (50 males, 48 females) who underwent single-level UBE decompression for LSS between January 2023 and February 2024 were retrospectively analyzed. All procedures were performed by a single surgeon who had extensive experience in open decompression but had no experience with endoscopic surgical techniques. Patients were followed for at least 12 months postoperatively. Data including age, gender, surgical level, operative time, complications, and follow-up duration were recorded. Clinical outcomes were assessed preoperatively and at final follow-up using the Visual Analog Scale (VAS), Oswestry Disability Index (ODI), and EuroQoI-5D (EQ-5D). The learning curve was evaluated using the Cumulative Total Analysis (CTA) method based on operative time and complication rates. The cutoff point of learning curve was determined as 37 cases. Accordingly, patients were divided into early (first 37) and late (subsequent 61) groups and all data were examined comparatively in these groups.

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UBE decompression - 1



bilateral decompression

UBE decompression - 2



bilateral decompression

**Findings**: The mean age of the patients was 70.8 years (range 50-80 years), and the mean follow-up period was 16.6 months

(range 12-24 months). Surgical levels included L2-3 (n=8), L3-4 (n=17), L4-5 (n=45), and L5-S1 (n=28). The operation time and complication rates were significantly different between the two groups. The mean operative time significantly decreased from 99.9 minutes in the early group to 73.5 minutes in the late group (p<0.001). A total of 12 complications were reported: dural tear (n=4), paresthesia (n=4), transient weakness (n=3), and amnesia (n=1). The complication rate was observed as 12.2% and decreased after the 37th case. The complication rate of early group was 18.9% and decreased to 8.2% in the late group (p<0.001). No significant differences were found between the two groups in terms of demographic characteristics or final clinical outcomes. At final follow-up, VAS, ODI, and EQOL-5D scores showed significant improvement compared to preoperative values (p<0.001).

Dural tear



**Result**: Considering the significant improvement in the clinical scores of the patients, UBE decompression is a highly effective minimally invasive approach used in the treatment of LSS. However, this minimally invasive approach requires a significant learning period for safe and successful surgical results. As surgical experience increases, operative times shorten, and complication rates decrease significantly.

**Keywords**: Unilateral biportal endoscopy, UBE, Lumbar spinal stenosis, Learning curve, Minimally invasive spine surgery

<u>Author Note</u>: I have been doing endoscopic spine surgery for about 2 years and I perform an average of 150 cases per year. I would like to share my experiences about the learning curve and observable complications with my colleagues who are interested in UBE spine surgery.

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## **Ref No: 8952**

#### **RETROSPECTIVE EVALUATION OF LUMBAR INTRADURAL SPINAL TUMORS**

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**Aim**: Lumbar intradural spinal tumors are lesions with variable histological diagnoses that may be associated with significant neurological deficits. These lesions can be effectively surgically treated with developing microsurgical methods and auxiliary techniques such as neuromonitoring. In this study, we aimed to evaluate the epidemiological characteristics, neurological status, pathology, postoperative follow-up and complications of patients who underwent surgery for lumbar intradural tumors between 2018 and 2024.

Material and Method: 26 cases that met the study criteria and were operated on for lumbar intradural tumors in our clinic between 2018 and 2024 were evaluated retrospectively

Findings: Gender distribution F:M ratio was 1:1. Age range was 9-76, mean was 46.03. 10 (38.4%) of the cases had schwannoma, 5 (19.2%) had meningioma, 5 (19.2%) had ependymoma, 2 (7.6%) had teratoma and 4 (15.3%) had other pathologies. There was motor deficit in 8 (30,7%) cases and urinary and fecal incontinence in 1 (3.8%) case. In 18 (69.2%) cases, neurological examination was normal in the preoperative and postoperative periods. Postoperative urinary incontinence developed in only 1 of the cases. . No additional postoperative deficit developed in 25 (96.1%) of the cases. Residual injury was observed in 2 (7.6%) of the cases and recurrence was observed in 4 (15.3). Wound revision was performed in 2 (7.6%) cases.

Pathology distribution

	N(26)			
TAINOLOGI	14(20)			
Schwannoma	10(%38,4)			
Meningioma	5(%19,2)			
Ependymoma	5(%19,2)			
Teratoma	2(%7,6)			
Other	4(%15.3)			
Pathology distribution				

Pathology distribution

Demographic distribution

Gender distribution(F:M)	1:1
Age average	46,03
Preop motor deficit	8(%30,7)
Postop additional deficit	1(%3,8)
Postop complication	2(%7,6)
Residue	2(%7,6)
Relapse	4(%15,3)

Demographic distribution

Result: Surgical resection of lumbar intradural spinal tumors can be performed quite effectively and with minimal complication rates. However, early diagnosis of cases and the type of pathology are seen as determinants of the clinical situation. We anticipate that early diagnosis and development of new treatment strategies for pathology will reduce disability rates due to these pathologies.

Keywords: Lumbar, Spinal, Tumor, Intradural, Retrospective

## **Ref No: 9042**

#### **COMPARATIVE BIOMECHANICAL ANALYSIS OF** DIFFERENT STABILIZATION METHODS FOR PROXIMAL JUNCTIONAL KYPHOSIS PREVENTION

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**Aim**: Proximal junctional kyphosis (PJK) is nowadays a problem with rigid systems made with pedicle screws due to improved instrument systems and understanding of spinal deformities . The aim of our studywas to determine which of the different materials placed proximal to the instrument is more durable with loading and to help the literature in reducing the incidence of PJK.

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**Material and Method**: In our study, 23 sheep spines were included in the study. Facet joints, interspinous and supraspinous ligaments of the spines included in the study were preserved. The first group was divided into four different groups between T2-7.The first group was the control group(A0) with 5 sheep spines, the second groupwas the mersilene tape (A1) in 6 sheep, the third group was the transverse hook(A2) in 6 sheep and the fourth group was the dual band (A3) system in 6 sheep. In the second stage, the interspinous ligament was cut at the level proximal to thepedicle screw level in the spine of 17 sheep and the mersilene tape(B1), transverse hook(B2) and dual band(B3) system were placed in 2 sheep as controlgroup(B0) and five sheep each proximally.

Dual band 1



İnterspinöz ligamanın kesildiği dual band uygulanan grupta deney öncesi

Dual band 2



İnterspinöz ligamanın kesildiği dual band uygulanan grupta deney sonrası

urkishspine

**Findings**: In the first phase of the study, where the interspinous ligament was intact, A0 group had an average of 335.88±53.46 Newton, A1 group had 473.97±89.13Newton, A2 group had 486.57±122.6 Newton, and A3 group had 436.00±86.16Newton. There was no significant difference between the Newton values obtained(p>0.05). In the second phase, where the interspinous ligament was cut, thecontrol group(B0) had 254.35±0.35 Newton, B1 group had 266.14±7.10 Newton, B2group had 276.38±29.42 Newton, and B3 group had 346.82±33.75 Newton. Newton values showed a statistically significant difference between groups(p=0.010; p<0.05). Newton values in the control group were statistically significantly lower than those in the dual band group (p=0.012; p<0.05). Comparing the experiments with and without cutting the interspinous ligament, Newton values of the A2 group, where the interspinous ligament was intact, were statistically significantly higher than those in the group with the cut interspinousligament(B2) (p=0.004; p<0.01). Similarly, the Newton values of the A1 group and A3 group with intact interspinous ligaments were statistically significantly higher than those in the groups with cut interspinous ligaments (B1-B3)(p=0.004; p<0.01and p=0.030; p<0.05, respectively).



#### Newton değerleri

Nev	wton	Grup				
Kontrol		Hook Mersilene tape Dual band p				
İnterspinöz ligaman	Ort±Ss	335,88±53,46	486,57±122,6	473,97±89,13	436,00±86,16	°0,063
kesilmemiş deney Medyan (Min- Maks)	314,3 (270,2-391,9)	449,7 (366,1-654,6)	452,4 (390,1-631,3)	401,9 (373,8-598,3)		
İnterspinöz	Ort±Ss	254,35±0,35	276,38±29,42	266,14±7,10	346,82±33,75	°0,010*
silmiş deney	Medyan (Min- Maks)	254,4 (254,1-254,6)	264,4 (259,2-328,8)	263,5 (258,5-276,4)	330,1 (320,9-399,1)	

<sup>a</sup>Kruskal Wallis Test&Dunn Benferroni Test

\*p<0,05

Gruplara göre Newton değerlerinin karşılaştırılması

**Result**: PJK is one of the most important problems waiting for a solution today. In our study, the importance of preserving the interspinous ligaments reemerged, and the use of dual bands increased the durability in the junction area.

Keywords: Proximal junctional kyphosis, dual band, sheep spine model, mersilene tape, interspinous ligament

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## **Ref No: 9068**

#### EFFECT OF PERIOPERATIVE INTRADISCAL RADIOFREQUENCY ABLATION IN ADDITION TO UNILATERAL APPROACH WITH BILATERAL DECOMPRESSION IN THE TREATMENT OF LUMBAR SPINAL STENOSIS

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**Aim**: In patients with lumbar spinal stenosis (LSS), multiple factors contribute to spinal canal narrowing. This condition can be managed using a unilateral approach with bilateral decompression (UBD) applied posteriorly. However, when anterior compression is also a contributing factor, additional interventions such as discectomy or fusion may be considered. This study aimed to assess the effectiveness of intradiscal radiofrequency ablation (RFA) in cases with soft disc protrusion to achieve maximal decompression while minimizing damage to anterior vertebral structures and reducing postoperative discogenic pain. The outcomes were recorded using postoperative pain scores (VAS, ODI) and supported by perioperative and postoperative imaging.

**Material and Method**: Eighteen patients with LSS and accompanying disc protrusion were included in the study. Dynamic radiographs, MRI, and CT were used to confirm the absence of instability criteria. Preoperative and 6-month postoperative pain scores were retrospectively recorded. Changes in protruded disc structures were documented using intraoperative surgical videos and postoperative MRI. Pain scores were compared between patients who underwent intradiscal RFA and those who did not.

**Findings**: Among the 8 patients who underwent intradiscal RFA, 5 demonstrated complete resolution of the protrusion, while 3 showed regression to a bulging stage. In the RFA group, the median preoperative VAS score was 8, decreasing to 2 postoperatively, while the median preoperative ODI score was 22, decreasing to 5 postoperatively. In contrast, in the group that underwent only UBD, the median preoperative VAS score was 7, decreasing to 3 postoperatively, and the median preoperative ODI score was 21, decreasing to 7 postoperatively.

**Result**: The addition of intradiscal RFA to the UBD technique in LSS patients significantly reduced anterior compression and provided superior pain management compared to UBD alone. **Keywords**: lumbar spinal stenosis, radiofrequency ablation, unilateral approach with bilateral decompression, postoperative discogenic pain

# Ref No: 9076

#### ANALYSIS OF DEMOGRAPHIC CHARACTERISTICS AND RADIOLOGICAL PARAMETERS EVALUATED BY COMPUTED TOMOGRAPHY IN ADULT CHRONIC COCCYDYNIA PATIENTS

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**Aim**: Chronic coccydynia remains a significant challenge in orthopedic practice. Its etiology is not fully understood, with multiple anatomical and biomechanical factors potentially contributing. Computed tomography (CT) allows detailed evaluation of the sacrococcygeal region, aiding in identifying radiological markers. This study aimed to analyze key radiological parameters and demographic characteristics in patients with chronic coccydynia to determine potential risk factors.

**Material and Method**: This retrospective study reviewed patients with chronic coccydynia who underwent CT in two centers between May 2022 and December 2023. Patients aged 20–60 years with symptoms lasting more than three months were included, while those with symptoms under three months or missing imaging data were excluded. Patients were classified by age, gender, and four age groups (20–30, 30–40, 40–50, 50–60 years). Radiological parameters assessed on sagittal CT images included the sacrococcygeal angle, intercoccygeal angle, and the presence of S5-Coc1 fusion. Normality was assessed using the Shapiro-Wilk test. Statistical analyses included Mann-Whitney U, Kruskal-Wallis, Student's t-test, ANOVA, Chi-square, and Spearman correlation tests, with significance set at p<0.05.



Findings: A total of 122 patients (mean age: 37.89 ± 12.10 years, min-max: 20-60) were included. Of these, 78 (63.93%) were female and 44 (36.07%) male. Age group distribution was: 20-30 years (33.61%), 30-40 years (28.69%), 40-50 years (20.49%), and 50–60 years (17.21%). The mean sacrococcygeal angle was 68.47° ± 15.05 (min-max: 14.3-89.6), and the mean intercoccygeal angle was 38.64° ± 19.09 (min-max: 0-85). Sacrococcygeal fusion was present in 53 patients (43.44%) and 69 (56.56%) absent. No significant differences in radiological parameters were found across age groups (p>0.05). Gender did not affect sacrococcygeal angle or fusion (p>0.05); however, the intercoccygeal angle was significantly lower in females  $(mean:35.73^{\circ} \pm 18.63)$  than in males  $(mean:43.79^{\circ} \pm 18.1)$ (p=0.02). Patients with sacrococcygeal fusion had a significantly smaller sacrococcygeal angle (mean:65.3° ± 16.54 vs. 72.2° ± 12.9; p=0.01). No other significant differences were found.

**Result**: Chronic coccydynia was 1.8 times more common in females, and the intercoccygeal angle was significantly narrower in female patients. Additionally, patients with sacrococcygeal fusion had a smaller sacrococcygeal angle. These findings suggest that the female gender and a lower intercoccygeal angle may contribute to chronic coccydynia etiology, while a reduced sacrococcygeal angle may influence S5-Coc1 fusion development. Further studies with larger cohorts and healthy controls are needed to validate these findings.

**Keywords**: Coccydynia, Demographic characteristics, Intercoccygeal angle, Sacrococcygeal angle, Sacrococcygeal fusion

## Ref No: 9084

#### SCOLIOSÍS IN CHEST WALL DEFORMITIES: COINCIDENCE OR A UNIQUE PATTERN?

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**Aim**: Pectus excavatum (PE) and pectus carinatum (PC) are the most common congenital chest wall deformities. Although these

deformities primarily affect the anterior thoracic structure, their relationship with spinal deformities and especially with scoliosis is attracting more and more attention. The aim of this study was to determine the prevalence and predictors of scoliosis in patients with PE and PC.

**Material and Method**: A retrospective analysis was performed on a total of 1,352 patients diagnosed with PE or PC in our centre. Demographic data (age, gender) of the patients were recorded. The presence and pattern of scoliosis were divided into four subgroups based on radiographic findings: proximal thoracic (PT), main thoracic (MT), thoracolumbar (TL) and lumbar (L). The direction of curvature was also evaluated as right or left.

**Findings**: Of a total of 1,352 patients, 803 (59.4%) were diagnosed as pectus excavatum (PE) and 549 (40.6%) as pectus carinatum (PC). The mean age was  $15.69 \pm 4.92$  years in PE patients and  $15.42 \pm 7.21$  years in PC patients. Male gender was predominant in both groups; 78.5% in the PE group and 78.9% in the PC group. The overall prevalence of scoliosis was 22.9% in the PE group and 8.4% in the PC group. When scoliosis subtypes were evaluated, proximal thoracic (PT) scoliosis was found in 16.2%, main thoracic (MT) in 7.6%, thoracolumbar (TL) in 5.1% and lumbar (L) in 0.5% in the PE group. In the PC group, PT scoliosis was observed in 6.4%, MT scoliosis in 3.3%, TL scoliosis in 2.2%, and L scoliosis was not detected.

**Result**: This study shows that the prevalence of scoliosis is significantly increased in patients with chest wall deformity, especially in individuals with PE. The findings suggest that the scoliosis pattern in chest wall deformities tends to increase especially in the proximal thoracic region.

Keywords: Pectus excavatum, pectus carinatum, scoliosis

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## Ref No: 9249

#### A NOVEL TECHNIQUE TO MINIMIZE FACIAL PRESSURE ULCERS DURING PRONE SURGERY: A RANDOMIZED CONTROLLED TRIAL

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**Aim**: This study aimed to compare facial pressure ulcers (FPU) in patients undergoing spine surgery who remained in the prone position for more than six hours and to assess the effectiveness of the proposed preventive measures.

**Material and Method**: This was a prospective, randomized trial. Patients undergoing spine surgery and staying in a prone position for more than six hours were included. Patients were randomized into two groups: Group A received standard anesthesia preparation with routine head positioning, while Group B used prone pads wrapped with cast padding and had the patients' faces covered by a surgical drape. Additionally, the results were analyzed based on surgical indications and categorized into degenerative and deformity subgroups. The FPU were classified according to the National Pressure Ulcer Advisory Panel Staging System.

Figure 1



Appearance of facial pressure ulcers of varying stages

#### figure 2



covering the patient's face with a surgical drape

#### figure 3



positioning on the prone pad



Table 1. Descriptive statistics of the patients

	Group A	Group B	
	(n=29)	(n=28)	μ
A	62.17	63.54	0.007
Age (years)	(51-74)	(50-78)	0.827
Gender			
Female	18 (62.1%)	15 (53.6%)	0 506
Male	11 (37.9%)	13 (46.4%)	0.090
Prone posi-	424.83	437.50	
tion duration (minutes)	(350-660)	(360-720)	0.986

Continuous data are presented as mean (min-max). Categorical data shown as n (%). P values were calculated using the Kolmogorov-Smirnov (exact) test

Tabla 2	Incidence	of facial	nraccura	ulcare	amona	nationte
Iadie 2.	IIICIUEIICE	UI IAUIAI	pressure	uicei s	annony	pallenis

	Group A	Group B	Significance
	(n=29)	(n=28)	(Effect Size)
FPU			
No	5 (17.2%)	12 (42.9%)	0.045*
NO	24 (82.8%)	16 (57.1%)	(0.280-small)
Yes			
	Degenerative Patients Only	Degenerative Patients Only	
	(n=20)	(n=20)	
FPU			
Ne		0 (45 00/)	0.320
NO	5 (25.0%)	9 (45.0%)	(0.210-small)
Yes	15 (75.0%)	11 (55.0%)	
	Deformity	Deformity	
	Patients Only	Patients	
EDU	(11=9)		
FFU			0.082
No	0 (0%)	3 (37.5%)	(0.491-
Yes	9 (100.0%)	5 (62.5%)	medium)
	Degenerative	Deformity	
	Group (n=40)	Group (n=17)	
FPU			0.004
No	14 (35.0%)	3 (17.6%)	0.224
			(0.174-small)
Yes	26 (65.0%)	14 (82.4%)	

FPU: facial pressure ulcer. Data are shown as n (%). P values were calculated using Fisher's exact test. Cramér's V was calculated to determine effect size. \*p<0.05.

Table 3. Distribution of facial pressure ulcers by stage

				o "
	Group A	Group B	Cinnifi	Overall
	(n_20)	(n_29)	Signifi- cance	Significance
	(11=29)	(11=20)	ounoo	(Effect Size)
Stage				
0	5 (17.2%)	12 (42.9%)	0 035*	
1	12 (41.4%)	11 (39.3%)	0.872	0.055
2	8 (27.6%)	5 (17.9%)	0.072	(0.365- medium)
3	4 (13.8%)	0 (0%)	0.381	
4	0 (0%)	0 (0%)	0.042*	
	Degenerative Patients Only (n=20)	Degenerative Patients Only (n=20)		
Stage				
0	5 (25.0%)	9 (45.0%)	0 185	
1	10 (50.0%)	8 (40.0%)	0.525	0.537
2	4 (20.0%)	3 (15.0%)	0.677	(0.250-small)
3	1 (5.0%)	0 (0%)	0.077	
4	0 (0%)	0 (0%)	0.311	
	Deform- ity Pa- tients Only (n=9)	Deformity Patients Only (n=8)		
Stage				
0	0 (0%)	3 (37.5%)	0.043*	
1	2 (22.2%)	3 (37.5%)	0.490	0.072
2	4 (44.4%)	2 (25.0%)	0.402	(0.634-large)
3	3 (33.3%)	0 (0%)	0.070	
4	0 (0%)	0 (0%)	0.072	

FPU: facial pressure ulcer.Data are shown as n (%). P values were calculated using Fisher's exact test. Cramér's V was
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calculated to determine effect size. \*p<0.05

**Findings**: The study included 29 and 28 patients in groups A and B, respectively. The FPU rate was significantly higher in Group A (82.8%) than in Group B (57.1%) across both degenerative (Group A, 75.0%; Group B, 55.0%) and deformity subgroups (Group A: 100%, Group B: 62.5%). Notably, the FPU rates in the deformity subgroup (82.4%) exceeded those in the degenerative subgroup (65.0%).

**Result**: Wrapping prone pads with cast padding and fully covering the face with a surgical drape is a simple, time-efficient, and universally applicable method that significantly reduces the incidence of FPU associated with the prone position.

**Keywords**: Deformities, degenerative pathologies, facial pressure ulcer, prone position, spinal surgery

but had progressive pain during this process. The fracture was stabilized at the C2-C3 level using a cannulated compression screw without performing a discectomy.

**Findings**: A 2.5 cm transverse incision was made at the C5-6 level, and after necessary dissection, open reduction was achieved under fluoroscopic guidance. The cannulated compression screw was then placed easily and quickly by accessing from the anteroinferior aspect of the C3 body towards the C2 odontoid type (passing through four cortices). The duration of the procedure was 30 minutes, with fluoroscopy used eight times during the case, and the intraoperative blood loss was 25 cc. This constitutes a viable surgical treatment option for elderly patients with a high comorbidity burden.(Figure-1)

Figure-1



The cannulated compression screw in our newly developed surgical technique for hangman fracture.

**Result**: By providing stabilization without performing discectomy, we supported the natural healing of the bone fracture. In selected cases, bone healing may be possible with only C2-C3 fixation. This surgical technique, which we used and, to the best of our knowledge, is being reported for the first time, offers advantages by reducing risk, shortening surgical time, and minimizing intraoperative bleeding, thus presenting new options to the literature.

**Keywords**: Hangman fracture, Cannulated compression screw, Trauma

### Ref No: 9356

# NEW TECHNICAL NOTE FOR THE TREATMENT OF HANGMAN FRACTURES WITH ANTERIOR APPROACH

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**Aim**: There are conservative and surgical approaches to the treatment of Hangman fractures. The fundamental goals of surgical treatment include reduction, stabilization, and preservation of alignment. The choice of surgical method has not yet been fully standardized, and anterior and/or posterior fusion options may be applied. Among existing clinical studies, there is no research showing significant differences in results or complication rates between anterior and posterior fusion. The selection of treatment may depend on factors such as age, comorbidities, the patient's vertebral anatomy, the degree of instability, and surgical experience.

**Material and Method**: In our study, we present a case of an osteoporotic elderly woman with a Type I Hangman fracture according to the Levine–Edwards classification, who was previously followed conservatively after experiencing trauma

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### **Ref No: 9440**

### CLINICAL CORRELATION OF CERVICAL PARAMETERS IN PATIENTS UNDERGOING ANTERIOR CERVICAL CORPECTOMY AND FUSION AFTER 2020

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**Aim**: Twelve patients who underwent anterior cervical corpectomy and fusion between 2020 and 2025 in our clinic were evaluated with cervical radiographic parameters and Neck Disability Index (NDI). Among the 12 patients we operated on in our clinic, 1 patient was in the very good group and 6 patients were in the good group according to the NDI results. These patients had higher postop C2-C7 cervical lordosis angles and lower BMI values compared to other patients.

**Material and Method**: Patients who underwent corpectomy were scanned through the hospital computer system. Age, gender, follow-up period, surgical indications, corpectomy level, BMI values of the patients were measured. Neck disability index (NDI) was performed in the outpatient clinic and the patients were divided into 5 main groups according to the questionnaire score: 0-4 points: no disability very good, 5-14 points: mild disability good, 15-24 points: moderate disability moderate, 25-34 points: severe disability bad, 35 and above total disability very bad. Corpus heights, cervical lordosis angles between C2 and C7, T1 slope angle and the distance of the upper endplate of the C7 vertebra from the segmental vertical axis (cSVA) were measured on preop and postop cervical radiographs.

### POST OPERATIVE XR IMAGES



POST OPERATIVE XR IMAGES



POST OPERATIVE IMAGES



**Findings**: Anterior cervical corpectomy + fusion surgery was performed in 12 patients between 2020 and 2025 in our clinic. 10 patients were male and 2 were female. The youngest patient was 19 years old and the oldest patient was 67 years

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old. 8 patients underwent corpectomy due to trauma, 2 due to degenerative spine disease, 1 due to tumor and 1 due to infection. The mean BMI of the patients was 23.2. According to the NDI, 1 patient was classified as very good, 6 as good, 4 as moderate and 1 as bad. In 2 patients, preop-postop corpus heights were the same. In the other 10 patients, postop corpus heights increased by 19% on average. Postop C2-C7 cervical lordosis angle values increased by 12.1% on average. There was no significant difference between preop and postop T1 slope angle values. cSVA measurement showed an average increase of 8.9%.

**Result**: According to the NDI, 1 patient was in the very good group and 6 patients were in the good group. These patients had higher postop C2-C7 cervical lordosis angles and lower BMI values compared to other patients. In conclusion, better clinical results are obtained in relatively thin patients in whom cervical lordosis is achieved.

**Keywords**: cervical corpectomy, anterior cervical decompression, cervical corpectomy cage, bmi

### **Ref No: 9446**

### THE RELATIONSHIP BETWEEN THE RING APOPHYSIS STAGE AND DEFORMITY PROGRESSION IN ADOLESCENT IDIOPATHIC SCOLIOSIS

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**Aim**: Various hypotheses exist regarding the etiology of adolescent idiopathic scoliosis (AIS). One of the least explored topics is the relationship between ring apophysis maturation and scoliosis progression. This study investigates the association between the maturation stage of the ring apophysis and scoliotic deformity progression in AIS patients. By analyzing the

ossification and fusion of the ring apophyses, which are critical for vertebral development, we aim to determine whether these findings can enhance prognostic accuracy in scoliosis.

**Material and Method**: We retrospectively reviewed AIS patients who presented to M.S. Baltalimani Bone Diseases Training and Research Hospital between 2003 and 2023. Patients included had at least two preoperative spinal computed tomography (CT) scans and two standing scoliosis X-rays, with a minimum six-month interval between imaging studies. A total of 36 patients met these criteria and were analyzed. The vertebral ring apophysis maturation level was assessed on both CT scans. Cobb's angles were measured on the initial and followup scoliosis X-rays. Correlations between changes in vertebral ring apophyseal maturation and Cobb's angles were evaluated. Additionally, the relationship between Cobb's angle changes and Risser stages, as well as proximal humeral physeal stages from the scoliosis X-rays, was examined.

**Findings**: In our study, a statistically significant relationship was found between the maturation process of the superior ring apophyses of the apex vertebra and changes in Cobb's angle (p=0.022). As ring apophysis maturation increased, Cobb's angle changes decreased. Similarly, a significant correlation was observed between the superior ring apophyses maturation of all vertebrae involved in the curve and Cobb's angle (p=0.006). However, the maturation of the inferior ring apophyses of the apex vertebra showed a trend similar to the superior apophyses but did not reach statistical significance (p=0.093). Likewise, no significant correlation was found between the maturation of the inferior ring apophyses of all vertebrae in the curve and Cobb's angle (p=0.092).

**Result**: Our findings indicate that AIS patients with more advanced ring apophysis maturation exhibit a significantly slower progression of Cobb's angle. While previous studies have linked spinal deformity progression to general skeletal maturity, our results highlight this correlation using a direct spinal development parameter. We propose that patients with immature apophyses or delayed apophyseal maturation during rapid growth phase are at higher risk of scoliosis progression. These findings support the use of ring apophysis maturation imaging as a predictive tool to improve prognostic assessments of scoliosis progression.

**Keywords**: Adolescent idiopatic scoliosis, Cobb's angle, humerus proximal physis, ring apophyses, Risser staging

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### **Ref No: 9502**

# THE EFFECT OF FUSION LEVELS ON CLINICAL OUTCOMES IN LOW LUMBAR VERTEBRAL FRACTURES

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**Aim**: Fractures of the lower lumbar (LL) spine are uncommon and present distinct biomechanical and clinical challenges compared to thoracolumbar (TL) fractures. Given the critical role of the LL region in spinal mobility and sagittal balance, an optimal surgical strategy remains a subject of debate. This study aimed to assess the mid- and long-term clinical and radiological outcomes of short-segment (SSPI) and long-segment (LSPI) posterior instrumentation for LL fractures and compare these findings with TL fractures.

**Material and Method**: A retrospective analysis was conducted on patients who underwent posterior instrumentation for LL (L3–L5) and TL (T10–L2) fractures between 2005 and 2022. Patients with a minimum follow-up of 24 months were included. Fractures were classified according to the AO Spine Thoracolumbar Spine Injury Classification System. The study cohort comprised 49 patients, including 16 LL (8 SSPI, 8 LSPI) and 33 TL fractures. Clinical outcomes were evaluated using the Oswestry Disability Index (ODI) and the Visual Analog Scale (VAS) for pain. Radiological outcomes were assessed by measuring the Sagittal Cobb Angle (SCA) preoperatively, postoperatively, and at the final follow-up. Statistical analyses were performed using nonparametric tests, with significance set at p < 0.05.

**Findings**: The mean follow-up duration was 84 months. Functional assessments demonstrated significantly lower ODI and VAS scores in the LL SSPI and TL groups compared to the LL LSPI group (ODI: p = 0.019, VAS: p = 0.005). Among LL fractures, SSPI resulted in ODI (p = 0.255) and VAS (p =0.066) scores comparable to TL fractures, suggesting minimal functional impairment. Radiologically, all groups exhibited significant improvements in SCA (p < 0.001).

**Result**: Short-segment posterior instrumentation is an effective approach for managing LL fractures, yielding functional

outcomes comparable to TL fractures while reducing surgical invasiveness. In contrast, long-segment fusion in LL fractures may contribute to greater functional impairment, underscoring the need for careful surgical decision-making to preserve spinal mobility. Further prospective studies are required to validate these findings and refine treatment protocols for LL fractures

**Keywords**: Lower lumbar fractures, posterior instrumentation, lumbar mobility, sagittal spine balance

### **Ref No: 9732**

### MANAGEMENT OF EARLY RECURRENT LUMBAR DISC HERNIATION: TRANSFORAMINAL LUMBAR INTERBODY FUSION VS RECURRENT DISCECTOMY

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**Aim**: Recurrent lumbar disc herniation is commonly managed with recurrent discectomy due to its minimal invasiveness, reduced blood loss, shorter hospital stay, and lower cost. However, increasing evidence highlights the role of segmental instability in recurrent cases, making fusion techniques a viable alternative. This study compares the outcomes of recurrent discectomy and transforaminal lumbar interbody fusion (TLIF) in patients with early same-level recurrent lumbar disc herniation.

**Material and Method**: Patients with recurrent lumbar disc herniation at the same level and on the same side after previous discectomy were included. We defined early recurrence as the reappearance of symptoms after a pain-free period within six months following discectomy, after initial relief of leg pain. Segmental instability was assessed using preoperative standing lateral flexion-extension radiographs. Patients with translation  $\geq 4$  mm or sagittal angulation  $\geq 10^{\circ}$  underwent TLIF, while those without instability were managed with recurrent discectomy. Outcomes analyzed included operative time, blood loss, hospital stay, complication rates, and preoperative and postoperative Oswestry Disability Index (ODI) scores.



Findings: A total of 39 patients (21 women, 18 men) were included. The recurrent discectomy group had 23 patients, while 16 underwent TLIF. The mean follow-up period was 3.4 years. No significant differences were observed in age and sex between groups. The mean age of the patients was 50.64 years (range: 29-72 years). Hospital stay (2.06 vs. 3.46 days) and operative time (81.4 vs. 127.1 minutes) were comparable. Mean intraoperative blood loss was higher in the TLIF group (164 mL) than in the recurrent discectomy group (88.75 mL). Durotomy was the most common complication, with significantly higher rates in the recurrent discectomy group. The recurrence rate was 21.7% in the recurrent discectomy group, whereas no recurrences were noted in the TLIF group. Preoperative Modic type 2 changes were present in 78.3% of discectomy patients and 87.5% of TLIF patients. All five patients with re-recurrence after recurrent discectomy had preoperative Modic type 2 changes.

**Result**: Both procedures yield similar results in terms of blood loss, operative time, and hospital stay. However, TLIF provides advantages, including lower durotomy rates and improved longterm pain control, attributed to stabilization and prevention of degenerative progression. Recurrent disc herniation following recurrent discectomy may lead to higher long-term costs, potentially exceeding the expenses associated with fusion surgery. Patient selection should be based on instability assessment to optimize clinical outcomes.

**Keywords**: Recurrent, Lumbar disc herniation, Discectomy, Surgical outcomes

### Ref No: 9735

### EVALUATING CHATGPT'S RESPONSES TO THE NASS CLINICAL GUIDELINE FOR THE DIAGNOSIS AND TREATMENT OF ADULTS WITH OSTEOPOROTIC VERTEBRAL COMPRESSION FRACTURES

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**Aim**: This study aimed to examine ChatGenerative Pre-Trained Transformer (GPT)'s answers to the clinical questions recom-

mended by the North American Spine Society (NASS) Clinical Guideline for the Diagnosis and Treatment of Adults with Osteoporotic Vertebral Compression Fractures and to seek an answer to the question "How much can we trust ChatGPT?" This guideline contained 29 questions and 74 answers. These answers were also provided with various degrees of recommendation.

**Material and Method**: Whether ChatGPT's answers to the questions included the answers in the NASS Clinical Guideline was evaluated using the 'point-answer' system. In the questions that it answered correctly, it was asked to evaluate the recommendation degree of both its own answer and the answer in the guideline. A criteria answer system was used for this purpose.

# Results of ChatGPT's responses to questions in the NASS guideline by category.



ChatGPT's overall performance in identifying the grade of recommendation for answers in the NASS guideline and its own responses.



ChatGPT's overall performance in identifying the grade of recommendation for answers in the NASS guideline and its own responses by category

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Table 1. Distributions of the number of questions and answers by category in the NASS guideline

Category	Number of ques- tions	Number of answers
Natural History	5	10
Cost-Effectiveness	1	1
Clinical Diagnosis	1	2
Medical Treatment	6	13
Imaging	2	6
Interventional Treatment	8	33
Surgical Treatment	6	9
All Categories	29	74

Table 2.	Distribution of ChatGPT responses to questions in	
	categories from the NASS guideline.	

	NASS	ChatGPT		p*
	Number of answers	Correct	Wrong	
Categories		n (%)	n (%)	
Natural History	10	7 (29.2)	3 (6.0)	0.011
Cost- Effectiveness	1	0 (0)	1 (2.0)	1.000
Clinical Diagnosis	2	0 (0)	2 (4.0)	1.000
Medical Treatment	13	7 (29.2)	6 (12.0)	0.102

Imaging	6	2 (8.3)	4 (8.0)	1.000
Interventional Treatment	33	7 (29.2)	26 (52.0)	0.064
Surgical Treatment	9	1 (4.2)	8 (16.0)	0.256
All Categories	74	24 (32.4)	50 (67.6)	

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\*Fisher-Freeman-Halton test. Significant p values are written in bold

Table 3. Comparison of ChatGPT's responses for grade of recommendation (n=24)

		Answers		р	
		Correct (%)	Wrong (%)		
Natural	NASS	7 (100)	0 (0)	-0.001**	
History	ChatGPT	0 (0)	7 (100)	a0.001	
Medical	NASS	7 (100)	0 (0)	a0 102	
Treatment	ChatGPT	4 (57.1)	3 (42.9)	a0.192	
Imaging	NASS	0 (0)	2 (100)		
	ChatGPT	0 (0)	2 (100)	-	
Interventi-	NASS	7 (100)	0 (0)	-0.400	
ment	ChatGPT	5 (71.4)	2 (28.6)	au.462	
Surgical	NASS	0 (0)	1 (100)		
Treatment	ChatGPT	0 (0)	1 (100)	-	
Tatal	NASS	21 (87.5)	3 (12.5)	b0.001**	
TULAI	ChatGPT	9 (37.5)	15 (62.5)		

aFisher's exact test bPearson's chi-square test \*\*p<0.01

**Findings**: ChatGPT correctly answered 24 questions (32.4%). It correctly identified the recommendation grade as 87.5% for the guideline answers and 37.5% for its own answers.

**Result**: The ChatGPT also provided information that supported its answer and stated that all its answers were evidence-based. It seems that ChatGPT can provide fake references and present false information to support its answer and convince the user of its answer. For those who do not have the method and time to investigate the accuracy of the source or who do not care about its accuracy, this false medical information can cause significant harm. The results of this study show that ChatGPT still requires



human supervision regarding health topics and that users should be informed about its limitations. In addition, ChatGPT must be integrated into reliable health platforms to save users from this scientific hallucination.

**Keywords**: Artificial intelligence, ChatGPT, information, osteoporosis, question response, safety, vertebral compression fractures **Result**: Lumbar CT HU values correlate more strongly with femoral neck DEXA T-scores than with lumbar DEXA T-scores,

statistically significant difference between these correlations

suggesting that HU measurements may provide a more reliable assessment of bone density in patients with degenerative spine. Utilizing HU values from routine preoperative CT scans could enhance osteoporosis evaluation, optimize surgical planning, and reduce the risk of implant-related complications.

Keywords: Lumbar CT, Hounsfield Unit, osteoporosis, DEXA

### Ref No: 9765

### LUMBAR CT HOUNSFIELD UNIT MEASUREMENTS PROVIDE A MORE RELIABLE OSTEOPOROSIS ASSESSMENT THAN LUMBAR DEXA IN DEGENERATIVE SPINE PATIENTS

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**Aim**: Accurate preoperative assessment of osteoporosis is crucial for surgical planning in elderly patients with degenerative spinal diseases. Dual-energy X-ray absorptiometry (DEXA) is the gold standard for osteoporosis diagnosis; however, degenerative spinal changes can lead to inaccuracies in lumbar DEXA measurements. This study evaluates the correlation between lumbar computed tomography (CT) Hounsfield unit (HU) values and DEXA T-scores, aiming to determine the utility of HU as an alternative tool for osteoporosis assessment.

**Material and Method**: A retrospective analysis was conducted on 103 patients aged  $\geq$ 65 years with degenerative spinal changes. Lumbar CT HU values (L1-L4) and DEXA T-scores (lumbar spine and femoral neck) were compared. Correlation analysis was performed using Pearson's coefficient, and statistical significance was set at p<0.05.

**Findings**: The mean lumbar CT HU value was  $120.2 \pm 38.6$ , while the mean lumbar and femoral neck DEXA T-scores were  $-0.88 \pm 1.25$  and  $-2.19 \pm 1.15$ , respectively. A weak correlation was observed between lumbar CT HU values and lumbar DEXA T-scores (r=0.17, p=0.089), whereas a stronger correlation was found between HU values and femoral neck DEXA T-scores (r=0.606, p<0.001). Fisher's z-transformation confirmed a

### Ref No: 9813

(z=3.755, p<0.001).

### A CASE REMINDING US THAT NOT ALL LOWER LIMB PARALYSIS STEMS FROM THE SPINE

Mustafa Arslan<sup>1</sup>, Sadık Tokar<sup>1</sup>

<sup>1</sup>Gaziantep Şehir Hastanesi

**Aim**: To emphasize the importance of considering vascular pathologies—such as acute aortoiliac occlusion—in the differential diagnosis of sudden lower limb paralysis, especially in the absence of spinal cord compression on imaging.

**Material and Method**: Patient Presentation & Neurological ExaminationRadiological Imaging: CT, MRI, CTAConsultations & Multidisciplinary Evaluation

**Findings**: The patient, a 60-year-old female with a medical history of diabetes mellitus (on oral antidiabetics), cardiac stent placement (on acetylsalicylic acid), and thyroidectomy (on thyroid hormone replacement), presented with acute, spontaneous bilateral lower limb paralysis and urinary incontinence, without signs of sensory loss or spinal shock. Neurological examination revealed complete motor loss (0/5 strength) in both lower extremities and urinary incontinence. No cranial or upper limb involvement was noted. Cranial CT and diffusion MRI were normal, ruling out cerebral causes. Spinal MRI showed L4–L5 grade 1 listhesis but no evidence of spinal cord compression, edema, or hemorrhage. Doppler ultrasound revealed absent arterial flow in the superficial and deep femoral, as well as popliteal arteries bilaterally. CT Angiography (CTA) demonstrated: Complete occlusion of the abdominal aorta starting at the infrarenal level.

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No contrast enhancement in bilateral iliac or femoral arteries. Collateral venous filling, suggesting chronic compensatory circulation. These findings supported a diagnosis of acute aortoiliac occlusion as the underlying cause of the patient's paraplegia, rather than a primary neurological etiology.

MRI of the thoracolumbar spine



MRI of the thoracolumbar spine revealed no acute spinal cord pathology.

CT Angiography (CTA)



Complete occlusion of the abdominal aorta starting at the infrarenal level, No contrast enhancement in bilateral iliac and femoral arteries, Bilateral iliac arteries not visualized due to lack of contrast filling CT Angiography (CTA)



Complete occlusion of the abdominal aorta starting at the infrarenal level, No contrast enhancement in bilateral iliac and femoral arteries, Bilateral iliac arteries not visualized due to lack of contrast filling

**Result**: The diagnostic workup ruled out central nervous system causes of paraplegia, including spinal cord compression and intracranial pathology. Vascular imaging revealed a complete occlusion of the infrarenal abdominal aorta with absence of flow in bilateral iliac and femoral arteries. Based on clinical findings, radiologic evidence, and specialist consultations, the final diagnosis was established as: Acute aortoiliac occlusion presenting with sudden bilateral lower limb paralysis and urinary incontinence, mimicking a spinal cord syndrome.

**Keywords**: Acute Paraplegia, Aortoiliac Occlusion, Vascular Mimic of Spinal Cord Syndrome, Non-compressive Paraplegia

<u>Author Note</u>: Dear Members of the Science Board, I respectfully submit this case presentation titled "A Case Reminding Us That Not All Lower Limb Paralysis Stems from the Spine" for your review and consideration. This case highlights a rare but critical condition — acute aortoiliac occlusion — which presented with symptoms mimicking spinal cord pathology, including sudden paraplegia and urinary incontinence. The report emphasizes the importance of considering vascular causes in the differential diagnosis of acute neurological deficits and underscores the value of multidisciplinary evaluation in atypical clinical presentations. Thank you for your attention and the opportunity to share this instructive case. Sincerely, Dr. Mustafa Arslan

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### **Ref No: 9883**

# USE OF FACET JOINT SPACING SYSTEMS IN LUMBAR DISCOPATHY AND STENOSIS CASES

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<sup>1</sup>Adana Şehir Eğitim ve Araştırma Hastanesi, Beyin ve Sinir Cerrahisi Kliniği

**Aim**: To provide an alternative to minimally invasive procedures in lumbar discopathy and spinal stenosis surgery with the help of interfacet joint spacer elements (DTRAX facet system).

**Material and Method**: Forty-five patients were evaluated with radiological and physical examination findings. MRI and CT are used for spinal canal anterior-posterior diameter, foramen and lateral recess height measurement and possible fusion surface development in preop, postop 3rd and 6th month period. Patients were evaluated with walking test, VAS and ODI pain scales. DTRAX facet system can be used in spinal, lateral recess and foraminal stenosis with/without grade 1-2 spondylolisthesis. It can be beneficial in moderate stenosis (anterior-posterior (A-P) diameter of the central spinal canal 5-10 mm, lateral recess height 2-3 mm, foraminal height 3-5 mm) without decompression. Additional absolute decompression is also required in more severe stenosis. Interfacet system is particularly effective by increasing the disc distance, reducing intradiscal pressure and creating space for fusion in the interfacet area.

**Findings**: Preop pain scores was VAS: 7-8 (severe), ODI:70-80% (crippled). VAS: 3 (mild), ODI: 40% (moderate disability) was found to have decreased to the level in postoperative 6th month (p 0.05). In the walking test, while the symptoms started at an average of 100 meters in the preoperative period, it was detected as an average of 500 meters in the postop 6th month (p 0.05). Mean spinal canal A-P diameter 4,7 mm, foraminal height 4,9 mm and lateral recess height 2,1 mm measured as preop period. In postop 6th month measured as 7,1mm, 6,4 mm and 2,5 mm (significant change was detected in terms of only spinal canal diameter and foramen height-p 0.05). Wound/ deep tissue infection was observed in 3 patients, while revision was performed with screw fixation systems in 5 patients due to additional level pathologies or instrument failure.

Placement Of Percutaneous Dtrax Interfacet Element And Radiological Evaluation



Unilateral DTRAX interfacet system in a case of spinal stenosis without decompression

Interfacet Elements With Unilateral Decompressive Approach In Severe Degenerative De Novo Scoliosis



Right L4-5, L5-S1 surgical intervention in an elderly male patient with prominent right sciatica

**Result**: Spinal stenosis can be eliminated with this method in suitable cases with minimally invasive intervention especially for central spinal or foraminal stenosis (no significant radiological or clinical improvement was observed in lateral recess syndrome). This method can be preferred instead of extensive decompression and multi-level instrumentation in patients with severe degenerative findings, multi-level disc or spinal canal pathologies and especially in elderly patients with high comorbidities. They provide smaller incisions, limited tissue dissection and shorten the duration of surgery and anesthesia. Neural injury, instrument malposition, wound/implant infection possibility and postoperative pain are considerably less compared to transpedicular screw stabilization systems. Percutaneous application, sufficient small incision and small implant size decrease possibility of complications.

**Keywords**: lumbar interfacet elements, DTRAX facet system, percutaneous, minimal invasive

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### **Ref No: 9926**

### INVESTIGATION OF LBX1 GENE POLYMORPHISMS IN INDIVIDUALS WITH ADOLESCENT IDIOPATHIC SCOLIOSIS

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<sup>3</sup>Bursa City Hospital, Department of Medical Genetics, Bursa, Türkiye

**Aim**: Adolescent Idiopathic Scoliosis (AIS) is a prevalent spinal condition typically diagnosed in individuals aged 10-18 years, without underlying systemic diseases. Despite its common occurrence, the genetic factors contributing to AIS remain poorly understood. The present study aimed to explore the potential etiological link between AIS and polymorphisms in the LBX1 gene (rs11190870, rs625039, rs11598564), and to assess their association with clinical factors such as gender, age, age at diagnosis, and Cobb angle. Moreover, it is the first study to examine these LBX1 gene polymorphisms in AIS patients from the Turkish patients.

**Material and Method**: The study cohort consisted of 301 individuals (Ethics Committee decision number: 2024-09/13, dated 05.06.2024), including 201 AIS patients (aged 10-18 years, Cobb angle  $\geq 10^{\circ}$ , with no genetic disorders or related diseases) and 100 healthy controls (aged 10-18 years, without scoliosis diagnosis). Polymorphisms in the LBX1 gene (rs11190870, rs625039, rs11598564) were analyzed using RT-PCR. DNA sequencing was performed to confirm the SNP regions, followed by statistical analysis to evaluate the significance of the findings.

**Findings**: The rs11190870 polymorphism of the LBX1 gene exhibited a statistically significant difference between AIS patients and the control group (201/117) (p<0.001). However, no significant associations were found for the other polymorphisms. Gender-based analysis revealed a significant association for the rs11598564 polymorphism, with a higher frequency observed in females (106/36) (p=0.029), whereas no significant gender-based differences were identified for the other polymorphisms.

**Result**: The study identified a significant association between the

rs11190870 polymorphism of the LBX1 gene and AIS in Turkish patients, providing initial insights into the genetic aspects of this condition in this population. Additionally, the study provides preliminary data for future research that will expand the sample size and investigate additional AIS-related polymorphisms. This study was supported by BUÜ BAP (Project No: TTU-2023-1349, ID: 1349 and THIZ-2024-1850, ID: 1850).

**Keywords**: Adolescent Idiopathic Scoliosis, LBX1, Single Nucleotide Polymorphism

### <u>References</u>

**Author Note**: Dear Editor-in-Chief, The LBX1 gene name should be written in italics; however, we were unable to apply italics in the system. Additionally, we noted discrepancies between the abstract titles on the conference website and those in the system. Accordingly, we have made the necessary adjustments to the abstract in alignment with the website. We submit this for your information. Best regards,

# Poster Presentations



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### **Ref No: 1026**

### INFECTION RATES IN PATIENTS UNDERGOING VERTEBROPLASTY WITH ANTIBIOTIC-LOADED CEMENT FOR OSTEOPOROTIC SPINE FRACTURES

<u>Sakhi Ahmad FAZLİ</u><sup>1</sup>, Umut Doğu AKTÜRK<sup>1</sup>, Gökhan MARALCAN<sup>1</sup>, Seyit Ali GÜMÜŞTAŞ<sup>1</sup>, İsmail OLTULU<sup>1</sup>

<sup>1</sup>Okan university orthopedics and traumatology department

**Aim**: The aim of this study was to evaluate whether the use of antibiotics during vertebroplasty for osteoporotic fractures in elderly patients reduces infection rates.

**Material and Method**: A total of 93 patients diagnosed with osteoporotic spine fractures underwent vertebroplasty using antibiotic-loaded cement at 165 levels. Among these patients, 28 had diabetes mellitus (DM), 46 had hypertension (HT), 18 had coronary artery disease, and 16 had both diabetes mellitus (DM) and hypertension (HT. In each case, 200 mg of Targocid was added to 10 cc of cement. The average follow-up period was determined to be 2 years (ranging from 1 to 3 years). The preoperative mean Visual Analog Scale (VAS) score was recorded as 8.

**Findings**: None of the patients developed an infection. No instability or pain necessitating revision surgery at the fracture site was observed. A significant decrease in postoperative VAS scores was noted.

**Result**: The use of antibiotic-loaded cement in vertebroplasty for osteoporotic spine fractures appears to be an effective approach in preventing infections.

Keywords: vertebroplasty, osteoporotic, antibiotic, infection

### Ref No: 1111

### EPIDEMIOLOGY AND TREATMENT TRENDS IN CERVICAL AND LUMBAR SPINE CANAL STENOSIS – A NATIONWIDE ANALYSIS

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**Aim**: For degenerative lumbar and cervical spinal canal stenosis current treatments trends and changes in the recent years are lacking. Therefore we assessed nationwide data on the inhospital treatments for degenerative spinal disease to provide a broad database of the patient collective and its developments of treatment patterns.

**Material and Method**: We obtained data from the federal statistic office in Germany for patients treated in-hospital with ICD-10 codes M48.02 and M48.06 between 2014 and 2023. Subsequently obtained data was processed and analyzed using linear regression modeling.

**Findings**: The total number of patients treated for cervical or lumbar spinal canal stenosis increased in the period from 2014 to 2023, while the duration of the in-hospital stay decreased. Especially, treatment for cervical spinal stenosis in older patients increased after 2020. Moreover, we see a trend towards operative procedures favoring shorter in-hospital stay and less complex approaches.



Fig. 1 Treated patients for cervical spinal canal stenosis between 2014 and 2023



A. Overview of patients treated in-hospital for the diagnosis M48.02 coding for cervical spinal canal stenosis according to age groups from 20 years until above 80 years. B. Pie chart of the age distributed number of treated patients for cervical spinal canal stenosis in 2014. C. Number of treated patients per year in age group 20-60 years (blue) and over 60 years (red). Linear correlation coefficient r and p value p for the linear regression model respectively are shown above. D. Pie chart of the age distributed number of treated patients for cervical spinal canal stenosis in 2023

Fig. 2 Treated patients for lumbar spinal canal stenosis between 2014 and 2023



A. Overview of patients treated in-hospital for the diagnosis

M48.06 coding for lumbar spinal canal stenosis according to age groups from 20 years ranging to above 80 years. B. Pie chart of the age distributed number of treated patients for lumbar spinal canal stenosis in 2014. C. Number of treated patients per year in age group 20-60 years (blue) and over 60 years (red). Linear correlation coefficient r and p value p for the linear regression model respectively are shown above. D. Pie chart of the age distributed number of treated patients for lumbar spinal canal stenosis in 2023.

Analysis of treatment trends



A. Number of patients with the diagnosis cervical spinal canal stenosis treated with operative treatment (left y axis = colored in grey) in relation to the years 2014 – 2023. Also the development of duration of the in-hospital in days is shown (right y axis = colored in red). Linear correlation coefficient r and p value p for the linear regression model respectively are shown above. Treatment was identified using corresponding OPS codes. B. Number of patients with the diagnosis cervical spinal canal stenosis treated with either decompression without (left y axis = colored in grey) or with stabilization (right y axis = colored in red) for the years 2014 - 2023. Linear correlation coefficient r and p value p for the linear regression model respectively are shown above. C. Number of patients with the diagnosis lumbar spinal canal stenosis treated with operative treatment (left y axis = colored in grey) in relation to the years 2014 - 2023. Also the development of duration of the in-hospital in days is shown (right y axis = colored in blue). Linear correlation coefficient r and p value p for the linear regression model respectively are shown above. Treatment was identified using corresponding OPS codes. D. Number of patients with the diagnosis lumbar spinal canal stenosis treated with either decompression without (left y axis = colored in grey) or with stabilization (right y axis = colored in blue) for the years 2014 – 2023. Linear correlation coefficient r and p value p for the linear regression model

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respectively are shown above.

**Result**: For spinal canal stenosis there is a tendency towards an higher need for in-hospital treatments for theses conditions. While treatment numbers are increasing we see a trend towards less complex operative procedures and shorter duration of the in-hospital stay.

**Keywords**: Cervical spinal canal stenosis, Lumbar spinal canal stenosis

### **Ref No: 1232**

# RARE RECURRENT GIANT FIBROSARCOMA IN THE LUMBAR REGION: A CASE REPORT

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**Aim**: Identification and surgical treatment of rare fibrosarcomas in the lumbar region.

**Material and Method**: Fibrosarcoma in the lumbar region is an exceedingly rare malignancy. Most published data consist of isolated case reports, primarily involving the sclerosing epithelioid fibrosarcoma (SEF) subtype. SEF is histologically characterized by the proliferation of round to oval cells within a dense sclerotic stroma. This tumor exhibits a high rate of recurrence and metastasis, with reported mortality rates ranging from 25% to 57%. Figure 1:

urkishspine



A1–2: Sagittal and axial T2-weighted MRI images showing the paraspinal muscle planes at the posterior aspect of the L2–L5 vertebrae. B1–2: Sagittal T2 STIR and coronal T2 SPIR MRI sequences demonstrating the paraspinal muscle planes at the posterior L2–L5 vertebral levels. C1–2: Sagittal T1 Dixon and coronal T1 SPIR MRI sequences showing the paraspinal muscle planes at the posterior L2–L5 vertebral region.

**Findings**: A 64-year-old female previously underwent total excision for a lumbar fibrosarcoma five years prior. She presented with a slowly enlarging, painful, and immobile mass in the same region. Physical examination revealed no neurological deficits. MRI and CT imaging demonstrated a  $91 \times 60 \times 96$  mm right paraspinal lesion extending from L2 to L5, which appeared hyperintense on T2-weighted images and showed diffuse contrast enhancement. Adjacent paraspinal muscles also exhibited contrast uptakeDue to the patient's prior fibrosarcoma diagnosis, she was scheduled for surgical excision. Intraoperatively, a firm, hemorrhagic mass was

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identified in the subcutaneous and paraspinal muscle planes without bone involvement. A gross total excision was achieved. The surgical cavity was reconstructed without skin defect, and the patient had an uneventful postoperative recovery. She was discharged with no complications and advised for outpatient follow-upHistopathological analysis showed pleomorphism, myxoid changes, focal necrosis, and a mitotic count of 6 per 10 high-power fields. Immunohistochemistry revealed negativity for SOX10, Desmin, SMA, MUC4, and EMA. The tumor was defined as a malignant spindle cell neoplasm. FISH analysis for MDM2/CCP12 yielded a ratio of 1 with insufficient hybridization signal.

**Result**: Recurrent fibrosarcoma in the lumbar region, especially when presenting as a subcutaneous mass with muscle invasion, should be considered in the differential diagnosis of soft tissue malignancies. Early imaging and histopathological evaluation are crucial. Radical excision remains the cornerstone of management due to the tumor's aggressive nature and high recurrence potential.

Figure 2:



A1–A2: Preoperative macroscopic views of the lumbar mass from lateral and superior perspectives, along with the excised lesion. B1–B2: Macroscopic appearance of the surgical field and the excised mass following resection in the lumbar region.

**Keywords**: Fibrosarcoma, paraspinal, spinal malignancy

### **Ref No: 1290**

### REPORT OF A PATIENT WHO UNDERWENT SKIP CORPECTOMY AND CAGE-PLATE STABILIZATION FOR SOLITARY FIBROUS TUMOR

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**Aim**: Solitary fibrous tumors (SFTs) are rare benign or low-grade malignant tumors of fibroblastic and mesenchymal origin. Their localization in the spinal epidural space is extremely rare. In this case report, we aimed to present a patient who underwent skip corpectomy and instrumentation due to SFT causing epidural compression at the C6 and T1 levels.

**Material and Method**: This is a case report in which the patient's epicrisis was evaluated retrospectively. MRI(magnetic resonance imaging) and CT(computed tomography) were used as imaging modalities. Surgery was performed in lateral decubitus position in accordance with neurosurgical procedures.

**Findings**: A 55-year-old woman presented with complaints of neck and arm pain. Neurologic examination revealed increased deep tendon reflexes and no loss of muscle strength. Magnetic resonance imaging (MRI) revealed a contrast enhancing extradural bone lesion with epidural compression at C6 and T1 vertebrae. The patient underwent skip corpectomy at the C6 and T1 levels with an anterior approach without sternotomy. The mass was removed almost completely. The defect formed after corpectomy was stabilized with corpectomy cages and anterior plate. The patient had no loss of muscle strength in the postoperative period. Pathological examination revealed a diagnosis of solitary fibrous tumor (grade 2). STAT6 positivity was detected in immunohistochemical examination. The patient was discharged with oncology recommendation in the postoperative period.

Preoperative MRI



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Postoperative sagittal section CT



**Result**: Solitary fibrous tumors are rare and uncommon lesions in the spinal epidural space. Skip corpectomy and instrumentation may be a successful surgical option for such lesions. Long-term follow-up of patients is important. This case contributes to the literature on the surgical management of spinal solitary fibrous tumors.

Keywords: Solitary fibrous tumors, corpectomy

### **Ref No: 1719**

### THE ROLE OF FRACTURE-LEVEL SCREW FIXATION IN PAIN CONTROL FOLLOWING POSTERIOR STABILIZATION OF TRAUMATIC LUMBAR FRACTURES: A RETROSPECTIVE STUDY

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Aim: Traumatic lumbar fractures are a major source of morbidity in spinal trauma, often requiring surgical stabilization. This retrospective study assesses the impact of placing pedicle screws at the fracture level on early postoperative pain. Between 2022 and 2024, 49 patients who underwent posterior lumbar fixation were categorized into two groups: Group A (with fracturelevel screws) and Group B (without). The results suggest that fracture-level instrumentation significantly improves early pain outcomes.IntroductionLumbar spinal trauma frequently results in mechanical instability, necessitating surgical intervention. Posterior instrumentation is the standard approach, yet the decision to include screws at the fractured vertebra remains controversial. Biomechanical studies suggest that fracturelevel screw placement enhances stability and may reduce pain by limiting micro-movements at the injury site during the early recovery phase [1].

**Material and Method**: A total of 49 patients treated surgically for traumatic lumbar fractures from 2022 to 2024 were retrospectively analyzed.\* Group A: Posterior stabilization including screws at the fractured vertebra  $(n=26)^*$  Group B: Posterior stabilization excluding screws at the fracture level (n=23)Early postoperative pain was evaluated using the Visual Analog Scale (VAS) at 24 hours, 72 hours, and 7 days postsurgery. Statistical comparison was performed with Student's t-test, and a p-value < 0.05 was considered statistically significant.

**Findings**: VAS scores were significantly lower in Group A at 24 and 72 hours postoperatively (p < 0.05). By the 7th day, pain levels between the groups showed no statistically significant difference. No major differences were found in complication rates or fusion success at 6-month follow-up.Our findings reinforce existing literature highlighting the biomechanical and clinical benefits of fracture-level screw fixation [1,4]. Reduced early postoperative pain in Group A is likely linked to increased segmental rigidity and decreased micromotion at the injury site. Although long-term pain levels and fusion success



did not differ, improved early pain control plays a vital role in postoperative mobilization and rehabilitation. Limitations include the retrospective design and limited sample size, but our results contribute to a growing body of evidence supporting this surgical technique.

Figure 1



STIR-TSE MRI demonstrating a traumatic burst fracture at L3 with disruption of the posterior ligamentous complex. This preoperative image confirms vertebral collapse and mechanical instability.

Figure 2



Postoperative lateral X-ray showing two fixation techniques: one that excludes screw placement at L3 (only at L1, L2, L4, L5) and another that includes L3 in the construct. The image illustrates improved construct rigidity with direct fixation of the fractured vertebra.

Table 1

Time Post-Surgery	Group A (With Fra- cture-Level Screw)	Group B (Without Fra- cture-Level Screw)	p-value
24 hours	4.2 ± 1.1	6.1 ± 1.3	0.001
72 hours	3.1 ± 1.0	5.0 ± 1.2	0.003
7 days	2.2 ± 0.9	2.5 ± 1.1	0.297

Comparison of Early Postoperative VAS Scores Between Groups Time Post-Surgery

**Result**: Inclusion of fracture-level screws in posterior lumbar stabilization enhances early postoperative pain relief without increasing complication rates. This method is particularly beneficial for patients with unstable vertebral injuries and should be considered to promote early recovery and reduce analgesic use.

**Keywords**: FractureLevel Screw Fixation, Early Postoperative Pain, Posterior Lumbar Stabilization

### **Ref No: 1806**

### FACET JOINT DENERVATION: A BIBLIOMETRIC ANALYSIS OF THE 50 MOST CITED ARTICLES

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**Aim**: Facet joint pathologies are among the most common causes of chronic spinal pain. Facet joint denervation is a widely used treatment method. We believe that evaluating the most cited articles on this topic will provide more detailed insights into facet joint denervation and contribute to future high-quality studies.

Material and Method: In January 2025, a search was conducted



using the Web of Science database. Studies published between 1975 and 2025 were ranked by citation count using the keywords "facet joint denervation," "facet denervation," and "radiofrequency denervation." Basic science and laboratory studies, as well as review articles, were excluded. The top 50 articles were analyzed using the VOSviewer program.

**Findings**: After applying the exclusion criteria, the 50 most cited articles were analyzed from a total of 524 studies. The most cited article had 322 citations. Regarding country distribution, the United States had the highest number of publications in the top 50 (n = 22). The journal with the highest number of publications was "Spine" (n = 11). The specialty with the most studies was Anesthesiology (n = 24). Among the top 10 most cited studies, a publication by Prof. Dr. Idil Tekin from Türkiye was also included.

The nations of origin of the top 50 articles about facet joint denervation



Top 10 most cited journals about facet joint denervation



Top 10 articles with the highest citation

Rank	Author	Title	WOS citation	Journal	Year
1	Van Kleef	Randomized trial of radiofrequency lumbar facet denervation for chronic low back pain	322	SPINE	1999
2	Chou	Nonsurgical Interventional Therapies for Low Back Pain A Review of the Evidence for an American Pain Society Clinical Practice Guide- line	299	SPINE	1999
3	Staal	Injection Therapy for Subacute and Chronic Low Back Pain An Updated Cochrane Review	238	SPINE	2009
4	Nath	Percutaneous lumbar zygapophysial (Facet) joint neurotomy using radiofrequency current, in the management of chronic low back pain - A randomized double-blind trial	230	SPINE	2008



5	Leclaire	Radiofrequency facet joint denervation in the treatment of low back pain - A placebo-con-trolled clinical trial to assess efficacy	229	SPINE	2001
6	Juch	Effect of Radiofrequency Denervation on Pain Intensity Among Patients With Chronic Low Back Pain The Mint Randomized Clinical Trials	185	JAMA-JOURNAL OF THE AMERICAN MEDICAL ASSOCI- ATION	2017
7	Van Wijk	Radiofrequency denervation of lumbar facet joints in the treatment of chronic low back pain - A randomized, double-blind, sham lesion-con- trolled trial	178	CLINICAL JOUR- NAL OF PAIN	2005
8	Machado	Analgesic effects of treatments for non-specific low back pain: a meta-analysis of placebo-con- trolled randomized trials	159	RHEUMATOLOGY	2009
9	Marks	FACET JOINT INJECTION AND FACET NERVE BLOCK - A RANDOMIZED COMPARISON IN 86 PATIENTS WITH CHRONIC LOW-BACK-PAIN	153	PAIN	1992
10	İdil Tekin	A comparison of conventional and pulsed ra- diofrequency denervation in the treatment of chronic facet joint pain	148	CLINICAL JOUR- NAL OF PAIN	2007

**Result**: This study analyzed the 50 most cited articles on facet joint denervation. Our findings will help researchers identify and utilize the most influential and significant studies among hundreds of publications.

Keywords: facet joint denervation, citation, bibliometrics

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### **Ref No: 2062**

# TRAUMATIC THORACIC KYPHOSIS: EXPERIENCE WITH REVISION SURGERY

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**Aim**: To present a case of traumatic thoracic kyphosis requiring revision surgery due to progressive deformity and persistent, refractory pain following initial kyphoplasty.

**Material and Method**: A 72-year-old male presented with thoracic back pain after a fall in August 2023. Neurological examination revealed no deficits. The patient underwent kyphoplasty at the Th12 vertebra in an external center (Fig. 1). Although initial symptomatic relief was achieved, his pain progressively worsened over time. Multiple pain management interventions were attempted without success. Serial radiographs demonstrated progressive kyphotic deformity, with Cobb angles measuring 25.3° and 26.5° at six-month intervals. Given the radiographic progression and refractory pain, revision surgery was planned. Posterior stabilization was performed with transpedicular screw-rod instrumentation spanning Th10 to L2 vertebrae (Fig. 2).

Figure 1





**Findings**: Early postoperative imaging revealed improvement of the Cobb angle to 21.1° on plain radiographs and 18.4° on computed tomography. Clinically, the patient reported significant reduction in pain, and no new neurological deficits were observed during follow-up.

**Result**: While minimally invasive procedures such as kyphoplasty are often initially effective in elderly patients with vertebral fractures, the risk of progressive deformity and persistent pain remains a significant concern. In this case, revision surgery following failed primary kyphoplasty resulted in satisfactory correction of spinal alignment and symptom relief. Long-segment posterior stabilization appears to be a reliable strategy for managing traumatic kyphosis in elderly, osteoporotic patients, providing durable biomechanical support and improved clinical outcomes.

**Keywords**: Traumatic thoracic kyphosis, Revision surgery, Progressive deformity

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### **Ref No: 2749**

### THORACIC VERTEBRAL METASTASIS OF TESTICULAR YOLK SAC TUMOR: A RARE CASE REPORT

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**Aim**: Yolk sac tumor is the most common malignant germ cell tumor of the testis. Its incidence peaks in two distinct periods: under the age of three and in the early 30s. Spinal metastases from testicular yolk sac tumors are extremely rare, typically involving the epidural or paraspinal regions. While chemotherapy is the primary treatment, surgical intervention is necessary in cases of neurological deficits.In this case report, we present a rare instance of testicular yolk sac tumor metastasizing to the thoracic vertebra.

Material and Method: A 23-year-old male patient with a history of surgery for a testicular yolk sac tumor 15 days prior was brought to our clinic by his family after experiencing suddenonset lower limb weakness the day before admission. The patient had a known diagnosis of mental retardation. Neurological examination revealed paraparetic lower extremities with a muscle strength of 2/5. Babinski reflex was bilaterally positive, and deep tendon reflexes in the lower extremities were absent. Sensory examination could not be performed due to the patient's cognitive impairment. Imaging studies showed an intensely contrast-enhancing extradural tumor at the T9-T10 vertebral level, invading the vertebral body and adjacent bone structures and extending into the spinal canal. Due to the newly developed neurological deficit, the patient underwent emergency surgery, including tumor excision, neural decompression, and spinal stabilization.

Figure 1



**Findings**: Early postoperative improvement was observed in the patient's paraparesis, with muscle strength increasing to 4/5. Histopathological examination confirmed a metastatic yolk sac tumor of germ cell origin. After wound healing, the patient was referred for chemotherapy, and radiotherapy was initiated in the first postoperative month.

**Result**: Vertebral metastases of yolk sac tumors are rare but can progress rapidly, leading to significant neurological deficits. Since metastatic yolk sac tumors are often resistant to chemotherapy and radiotherapy, surgical decompression and stabilization should be performed when compression symptoms are present.

**Keywords**: Vertebral metastases, testicular yolk sac tumor, spinal tumor

### **Ref No: 2768**

### MINIMALLY INVASIVE TRANSFORAMINAL APPROACH AFTER KYPHOPLASTY COMPLICATION

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Aim: Kyphoplasty is a commonly used minimally invasive treatment for vertebral compression fracture due to

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osteoporosis. The kyphoplasty technique was developed to treat pain caused by vertebral compression fracture. A complication rate of 0.8-6% has been reported for kyphoplasty, which includes embolism, infection and cement extravasation. We planned to present a case of complication management with a minimally invasive transforaminal endoscopic approach in a patient with L4 radiculopathy and cement extravasation after kyphoplasty.

**Material and Method**: A 60-year-old woman was operated for L5 compression fracture and kyphoplasty was preferred. She had no preoperative neurologic deficit and postoperative examination revealed paresthesia consistent with L4 nerve root dermatome. Postoperative CT imaging showed extruded kyphoplasty cement traveling along the L4 nerve root foramen.A transforaminal endoscopic procedure was decided to remove the extruded cement and decompress the right L4 nerve. It was entered with the help of standard endoscopic portals. The L4 foramen was reached, extravasated cement was removed and the L4 nerve root was decompressed. The patient's neurologic examination was intact at the postoperative examination.

fluoroscopy images



Intraop fluoroscopy images

extravasated cement material



intra operative extravasated cement material

intra-operative L4 nerve root



intra-operative L4 nerve root decompression

**Findings**: After 3 months postoperatively, the patient had no clinical symptoms related to compression fracture and L4 nerve root irritation.

**Result**: Cement extravasation after kyphoplasty has been reported up to 6% in studies. There are open and closed surgical methods for the removal of extravasated cement. There are studies reporting that minimally invasive treatment methods should be preferred in terms of patient comfort and not causing vertebral instability. In the literature, endoscopic spine surgery has been shown to be an effective method for lateral paracentral central extruded contralateral discs and spinal stenosis pathologies in the lumbar spine. In this case report, we believe that the minimally invasive transforaminal endoscopic approach can be used safely in kyphoplasty complications compared to other treatment options.

Keywords: Transforaminal Ube Kyphoplasty Complicati

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### **Ref No: 3286**

### A RARE COMPLICATION OF LUMBAR FACET AND TRANSFORAMINAL INJECTIONS: PERSISTENT HICCUPS

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**Aim**: In this study, a case of persistent hiccup after lumbar facet and transforaminal injection is presented and the management of this rare complication is discussed in the light of the existing literature. With this case, we aim to contribute to clinical practice and raise awareness of potential complications that may develop after injection.

**Material and Method**: A 55-year-old male patient was admitted to our clinic with low back and right leg pain. Vas score was 8 and right lasaque test was positive. He had no known history of any disease. L4-5 spinal stenosis and lumbar disc herniation were detected on lumbar MRI. Facet and transforaminal injection was recommended to the patient who did not want surgical treatment and the procedure was performed after signed consent was obtained. After the procedure, the patient's symptoms regressed and she complained of persistent hiccups starting 1 month later. Esophago-gastro-duodenoscopy, colonoscopy and pulmonary CT angiography were performed, but the cause of persistent hiccups could not be found. The hiccup symptom was controlled with chlorpromazine 100 mg for 4 months, gabapentin for 8 months and finally baclofen 10 mg for the last month.

T2 sagittal and axial MRI images of the patient taken before the procedure



Findings: Lumbar facet joint injections and lumbar transforaminal injections are interventional procedures commonly used in the treatment of conditions such as low back pain and radiculopathy. These procedures aim to reduce inflammation and manage pain by injecting local anesthetics and steroids directly into the affected areas. Although injections are generally effective, some systemic and local complications may develop, although rare. One of the most notable and often overlooked of these complications is persistent hiccups. Hiccups are the result of involuntary contractions of the diaphragm and are usually short-lived and transient. However, in some cases, hiccups become persistent and resistant to treatment. Resistant hiccups after lumbar facet and transforaminal injections is one of these rare complications and is particularly notable for its effect on the central nervous system. The effects of steroids and local anesthetics on the brain stem may play a role in triggering the hiccup reflex.

**Result**: This case highlights the importance of the complication of persistent hiccups after lumbar facet and transforaminal injections. Although no additional pathology can be found with other imaging methods, controlling the symptom may be a long process.

Keywords: Facet, Transforaminal, Hiccup

### Ref No: 3541

### EVALUATION OF LENKE CLASSIFICATION USING ARTIFICIAL INTELLIGENCE IN ADOLESCENT IDIOPATHIC SCOLIOSIS PATIENTS

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**Aim**: This study aims to develop an artificial intelligence (AI) model using deep learning algorithms to perform the Lenke classification in adolescent idiopathic scoliosis (AIS) patients objectively, quickly, and consistently, and to evaluate its effectiveness compared to physician classifications.

Material and Method: The radiographs of 188 AIS patients

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were retrospectively analyzed. Of these, 164 were used for AI model training, while the remainder were used to compare the model's classifications with those of physicians. Image processing techniques, including segmentation, were applied to detect vertebrae and identify spinal alignments. The AI model with the highest test performance was selected and compared with Lenke classifications by three junior and three senior expert physicians. Independent t test was used in the comparison of paired groups of variables, Kappa test was used in inter-observer comparisons of qualitative data and significance was evaluated at p<0.05 level.

**Findings**: Senior physicians generated report results significantly faster than junior physicians (p < 0.05). The Al model generated report results for 24 patients in a total of 22 minutes, outperforming both physician groups in terms of speed. For curve type assessment, a low level of significant agreement was found between the junior physician group and both the senior physician group and the Al, while a high level of significant agreement was found between the senior physician group and the Al (p < 0.05). For the lumbar vertebra modifier, there was a low level of significant agreement between the senior physician group and the Al, and a high level of significant agreement between the senior physician group and the Al (p < 0.05). For the Lenke classification, the Al model showed a low level of agreement with junior physician and a moderate level of agreement with senior physician (p < 0.05).

**Result**: The artificial intelligence model produced predictions that were more consistent with the classifications made by senior physicians. This suggests that artificial intelligence has the potential to reduce inter-physician measurement differences and measurement errors of junior physicians. The clinical reliability and effectiveness of artificial intelligence as a tool to assist physicians in orthopedics and traumatology should be improved in future studies.

**Keywords**: Adolescent idiopathic scoliosis, artificial intelligence, deep learning, Lenke classification

### Ref No: 3604

### HOW I DO IT: FULL ENDOSCOPIC INTERLAMINAR APPROACH FOR TREATMENT OF ADJACENT SEGMENT DISEASE

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**Aim**: Adjacent segment disease (ASD) is a significant clinical complication following spinal fusion surgery, characterized by the degeneration of spinal segments adjacent to the fused area. The aim of this study was to evaluate the short-term efficacy and safety and to analyze the technical advantages, surgical approach, and indications of percutaneous full endoscopic interlaminar approach (PEILA) in the treatment of ASD after lumbar fusion.

**Material and Method**: A retrospective of 12 patients with symptomatic ASD were accepted for PEILA from October 2022 to December 2024. PEILA was applied tol all patients. The operation time and intraoperative conditions were recorded. Preoperative, 3,6,12 months of postoperative and at the last follow-up, the pain of back and leg of visual analog scale (VAS), Oswestry dysfunction index (ODI) were performed. The clinical efficacy was evaluated according to MacNab standards. The lumbar MRI was performed to evaluate the decompression of the nerve roots, and the lumbar lateral and dynamic X-rays were performed to evaluate the stability of the surgical segment.

**Findings**: A total of 12 patients (average of age, $63.50\pm11.32$ ) were included in the study, including 7 males and 5 females. The follow-up time ranged from 6 to 24 months, with an average of (12.9 ±5.4) months and an average operation time of (72.7±35.1) minutes. Compared to preoperatively, the VAS score of the back and leg pain (p < 0.05) and ODI (p < 0.05) postoperatively were significantly improved. At the last follow-up, according to the modified MacNab standard assessment, 7 cases were excellent, 3 cases were good, and 2 cases were fair, the excellent and good rate was 83.33%. As for complications, no patient had a dural sac defect during the operation, and no patient developed recurrence or instability as of the last follow-up.

**Result**: PEILA showed satisfactory short-term efficacy and safety in the management of ASD after lumbar fusion. There is a need for prospective studies that include larger patient population with mid- and long-term outcomes which evaluate iatrogenic instability findings.

**Keywords**: Adjacent Segment Disease; Lumbar Fusion; Minimally Invasive; Percutaneous Full Endoscopic Interlaminar Approach

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### **Ref No: 3749**

# CONUS INJURY SECONDARY TO EPIDURAL ANESTHESIA: A CASE REPORT

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**Aim**: Cauda injury is a rare complication of spinal or epidural anesthesia. The case of a patient who developed cauda equina injury following epidural anesthesia is presented.

**Material and Method**: This case report present a case of conus injury due to an epidural anesthesia attempt in a patient who underwent surgery by the orthopedics department for a tibial fracture, as well as its management.

Findings: A 35-year-old male patient was admitted to an external emergency department after trauma, a tibial fracture was detected. The patient underwent surgery under epidural anesthesia by the orthopedics department.Postoperatively, the patient was found to have weakness in the left lower extremity, and an MRI was performed. (Figure 1. and 2.) Following the MRI, a cauda equina injury was detected, and the patient was referred to our department.On physical examination, the patient was found to have muscle weakness in the left lower extremity, but no urinary or fecal incontinence or retention was observed. The treatment options were explained to the patient, who declined the surgical option. Steroid therapy was initiated, and the patient was subsequently transferred to the physical therapy and rehabilitation unit. Follow-up continued with serial MRI imaging, which showed hematoma resorption and improvement in motor strength.(Figure 3.)

Figure 1.



The T1 sequence of the initial admission MRI Figure 2.



The T2 sequence of the initial admission MRI

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Figure 3.



The T1 sequence of the pre-discharge MRI

Result: Conus injury should be considered in patients undergoing spinal or epidural anesthesia. Prompt evaluation with MRI and early initiation of treatment are crucial. Additionally, supporting the patient with physical therapy plays an important role. In these patients, medical treatment with close observation is also a viable option

Keywords: epidural, conus, injury

### **Ref No: 3791**

### A CHALLENGING CASE IN RECURRENT VERTEBRAL CHONDROSARCOMA SURGERY

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Aim: Chondrosarcomas are rare primary malignant bone tumors and generally slow growing tumors with a high potential for local invasion. Since the efficacy of radiotherapy and chemotherapy is limited, surgical excision is the most effective treatment option. Surgical planning becomes more complicated in recurrent cases, and surgical treatment is usually the main approach. In this case report, we aimed to present the surgical management of a repeatedly operated and recurrent vertebral chondrosarcoma.

**Material and Method**: This is a case report in which the patient's epicrisis was evaluated retrospectively. MR and CT were used as imaging modalities. Surgery was performed in lateral decubitus position in accordance with neurosurgical procedures.

Findings: A 41-year-old male patient has been followed for vertebral chondrosarcoma for fifteen years. He underwent multiple outpatient surgeries for chondrosarcoma growing from multiple parts of his body and from the cervicothoracic junction. The patient, who had gait disturbance and right upper extremity plegia due to previous surgeries, presented to us with a recurrent and severely enlarged mass at the right cervicothoracic junction. MRI and CT examinations revealed a locally invasive mass originating from the vertebral body and extending to the right shoulder, right lung apex and C2 vertebra level. The patient was evaluated by neurosurgery, otolaryngology, thoracic surgery, plastic and reconstructive surgery physicians. Surgical excision of the mass was decided. The tumor was almost completely removed. Subclavian artery injury occurred during surgery. Vascular injury was intervened with cardiovascular surgery. In the postoperative period, pulse was monitored in the right arm with heparin infusion. Due to the removal of a significant volume of mass from the neck, the external appearance improved. The patient was discharged with physical therapy and rehabilitation recommendations for neck movements.

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Preoperative and Postoperative coronal section MR images



Preoperative photograph of the patient's neck



**Result**: The aggressive and recurrent nature of the tumor makes surgery mandatory in the treatment of vertebral chondrosarcoma. In this case, although complete excision could not be achieved due to critical anatomical structures, reduction of near-total tumor burden significantly improved patient survival and quality of life. There are limited case reports of recurrent vertebral chondrosarcoma surgery in the literature, so this case has important implications for surgical strategy and planning. Surgical treatment of recurrent vertebral chondrosarcoma should be carefully planned, taking into account the relationship with critical structures. This case demonstrates that surgical treatment is still the most effective approach in recurrent cases and that even near total excision can provide significant improvement.

### Ref No: 3808

# FORESTIER – ROTES - QUEROL DISEASE PRESENTING WITH DYPHAGIA AND HOARSENESS

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**Aim**: Forestier disease, also known as Diffuse Idiopathic Skeletal Hyperostosis, is an abnormal osseous formation that forms in the anterior surface of vertabrae, cervical vertabrae in particular. Ligaments, joints, capsules and insertions of muscles and tendons (entheses) are the ones that are mainly affected by this abnormal ossification. It is presented by entesopathy of the spine and extremities, dysphagia, stiffness and hoarseness while the etiology remains unknown. It may be accompanied by PLL calcification in some occasions as well. On the other hand, osteoarthritis should be considered in differential diagnosis. Treatment is usually conservative but surgery may be preferred in specific situations. In this study, we are going to discuss the five patients that is diagnosed as Forestier's Disease. Two of them are treated by surgery while medical treatment and regular follow ups are opted for the other three.

**Material and Method**: Electromyelography, MRI and CT scan are performed for each patient. Chronic neurogenic irritation of the roots is observed in the regions of calcified soft tissues. Due to the severity of root compressions, dysphagia and hoarseness, surgery is applied in two of the cases. Osteophytectomy by anterior approach of the relevant segments of the spine is the preferred procedure. And as for less severe cases that we came across, we made a regular follow up with ct scan and medical treatments. There are 4 men and 1 women while median age is 65,4.

**Findings**: Here are follow up patients' ct's and preop and postop ct scans of the operated patients in sagittal plan:

Keywords: Vertebral chondrosarcoma



C4-5, C5-6 Anterior Osteophytectomy, Preop - Postop CT



C3-4, C4-5 Anterior Osteophytectomy, Preop - Postop Ct



Follow Up Patients 1 and 2



**Result**: The decision between surgery and medical choices is often made by evaluating how affected patient's life conditions by this disease. A scoring system of ostephytes called Mata analysis is also used to describe the severity of the disease. Nevertheless, the scoring system is based upon ct scan and doesn't involve clinical examination and presence of any kind of neurologic deficit. Although medical conservative approach is considered to be the preferential basis, surgery should always be taken into consideration in these patients. Age, physical and socioeconomic status of the patient should be borne in mind while making the right decision for the patient.

**Keywords**: Forestier, DISH, Cervical, Degenerative Vertebrae, Dysphagia, Hoarseness

### **Ref No: 3946**

### ACUTE PARAPLEGIA DEVELOPING AFTER Spontaneous spinal epidural hematoma, case Report

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**Aim**: Spinal epidural hematomas are a very rare pathology. They constitute less than 1% of all lesions that can be seen in the spinal canal. Spontaneous spinal epidural hematomas that develop without a known traumatic or iatrogenic cause are thought to occur at a rate of 0.1 per 100,000 per year. The primary causes are estimated to be coagulopathies or arteriovenous malformations. Spontaneous spinal epidural hematomas can also occur in conditions such as anticoagulant use, Valsalva maneuver and hypertension. This study aimed to show that spontaneous spinal epidural hemorrhages are one of the pathologies that should be considered in the etiology of patients presenting to the emergency department with acute paraplegia.

**Material and Method**: A 46-year-old male patient who applied to the emergency room with severe pain and tenderness in the thoracic region; acute paraplegia and urinary incontinence were detected in the lower extremity during physical examination. The patient underwent an emergency total spinal MRI. Extradural lesions were observed at the T8-T9 levels in the thoracic MRI.



Figure 1: Thoracic epidural hematoma, contrast-enhanced T1 sagittal section



Contrast-enhanced T1 sagittal section on thoracic MRI showed a non-enhancing epidural lesion at the T8-9 level.

Figure 2:: Thoracic epidural hematoma, non-contrast T2 axial section



An isointense extradural lesion at the level of T8-9 was demonstrated on non-contrast T2 axial section of thoracic MRI.

Figure 3: Thoracic epidural hematoma, non-contrast T2 sagittal section



Thoracic MRI showed an isointense extradural lesion at the T8-9 level on non-contrast T2 sagittal section.

**Findings**: The patient was taken to surgery under emergency conditions. After the T8-T9 laminectomy, a hematoma that started to consolidate was observed in the epidural area. After the epidural hematoma was drained, the dura was opened linearly. Pulsation was observed after the CSF drainage. In the patient's early postoperative examination, it was observed that the loss of sensation and motor loss decreased. It was observed that urinary incontinence did not continue in the postoperative period. He was provided with physiotherapy by consulting the physical therapy and rehabilitation clinic. It was observed that the lower extremity motor strength increased from 1/5 to 3/5 on the 3rd postoperative day. It was observed that the patient was mobilized with a walker in the 2nd postoperative month.

**Result**: In patients presenting with acute paraplegia, it is very important to consider spontaneous spinal epidural hemorrhage in the differential diagnosis and to intervene early. It has been observed that emergency surgery for the lesion contributes significantly to the recovery of the patient's neurodeficit in the early period.

Keywords: spinal epidural hematoma, coagulopathy, paraplegia

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### **Ref No: 4068**

### UNEXPECTED POSTERIOR EPIDURAL LESION IN A CASE OF LUMBAR SPINAL STENOSIS: A DEGENERATIVE DISC MATERIAL

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**Aim**: Lumbar spinal stenosis (LSS) is a common degenerative condition in the elderly, often resulting inneurogenic claudication and radicular pain. Although posterior epidural lesions are rare, they cansometimes be encountered unexpectedly during surgery. Here, we present a case of LSS with anincidental posterior epidural lesion found intraoperatively, later diagnosed as degenerated discmaterial(1-2-3).

**Material and Method**: A 62 myear old male patient presented with chronic low back pain and bilateral radicular leg pain,more pronounced on the right side, along with neurogenic claudication. A non-contrast lumbar MRIrevealed significant spinal stenosis at the L2-3 level (Figure 1).Due to refractory symptoms despite conservative management, L3 total laminectomy and L2-3posterior instrumentation were planned. During surgery, an unexpected lesion was observed in theposterior epidural space compressing the dura (Figure 2). The lesion was excised and sent forhistopathological evaluation.Histology revealed degenerated nucleus pulposus tissue, confirming the diagnosis of posteriorlymigrated disc material, a rare finding in this location.

**Findings**: Posterior migration of disc material is an unusual phenomenon, particularly in the upper lumbarregion. Most herniated discs migrate anteriorly or laterally; however, posterior migration into thedorsal epidural space can mimic other lesions such as tumors, abscesses, or hematomas. This case highlights the importance of considering degenerated disc fragments in the differential diagnosis of epidural lesions, especially when encountered intraoperatively in patients with spinalstenosis.



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Preoperative and Postoperative Sagittal / Axial T2-weighted lumbar MRI showing severe spinal canal narrowing at L2-3





Intraoperative photo showing the posterior epidural lesion compressing the dura before excision.

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**Result**: Surgeons should be aware of the rare possibility of posteriorly migrated disc fragments duringspinal decompression surgery. Intraoperative vigilance and histopathological confirmation remainkey for accurate diagnosis and management.

**Keywords**: Lumbar spinal stenosis, Posterior epidural lesion, Spinal decompression surgery, Histopathological diagnosis Figure 1

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### Ref No: 4214

# DUMBBELL-SHAPED SCHWANNOMA AT C2 LEVEL IN A 52-YEAR-OLD FEMALE: CASE REPORT

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**Aim**: Schwannomas are benign nerve sheath tumors originating from Schwann cells. While they are mostfrequently found in the lumbar and thoracic regions, cervical intradural extramedullary schwannomasare rare, particularly those presenting with a dumbbell configuration extending through the neuralforamen. These tumors can exert mass effect on the spinal cord and cause neurological symptomsdue to their location (2-3). This study a 52-year-old female presented to our outpatient clinic with complaints of persistent neck pain andnumbness in both upper limbs for the past 3 months. Neurological examination was intact, withoutsigns of motor or sensory deficits. Cervical spine MRI revealed a well-defined intraduralextramedullary mass at the level of C2 vertebral body, demonstrating contrast enhancement with gadolinium, and showing a dumbbell shape extending into the neural foramen (Figure 1).

**Material and Method**: The patient underwent posterior cervical laminectomy at C2 with microsurgical resection of thetumor under intraoperative neurophysiological monitoring. The tumor was identified as awell-encapsulated mass displacing the spinal cord anteriorly. Internal debulking was followed by extracapsular dissection to avoid injury to the spinal cord and nerve roots. Gross total resection wasachieved.

Preoperative sagittal T1-weighted MRI with contrast showing a homogeneously enhancing intradural extramedullary mass at C2 level (arrows).

**Findings**: Postoperative MRI confirmed complete tumor removal with no residual mass (Figure 2). The patienthad no new neurological deficits and reported significant improvement in neck pain and resolution ofparesthesias. Histopathological examination confirmed the diagnosis of schwannoma (Antoni A andB areas, Verocay bodies). At 6-month follow-up, he remained asymptomatic without recurrence.





Postoperative MRI demonstrating complete resection of the tumor, with decompressed spinal cord.

**Result**: Cervical dumbbell schwannomas pose a surgical challenge due to their location and proximity to critical neurovascular structures. Posterior approaches with laminectomy and microsurgical techniques remain effective, especially in tumors with predominant intraspinal components. Total resection is curative in the majority of cases and significantly reduces the risk of recurrence (1).

**Keywords**: Cervical Schwannoma, Dumbbell Tumor, Microsurgical Resection

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### **Ref No**: 4226

# TRANSDURAL APPROACH TO TLIF MALPOSITION, CASE REPORT

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**Aim**: TLIF is used for anterior fusion in lumbar stenosis and lumbar listhesis surgeries. In cases where TLIF is used, some complications may occur. In this study, a patient who was operated for lumbar stenosis and presented with loss of strength and radicular pain two years after the operation was examined. TLIF malposition was detected in the examinations performed on the patient. We aimed to present the patient whose TLIF was removed transdurally during the operation.

**Material and Method**: A 30-year-old male patient presented with right leg weakness and radiculopathy that began two months ago. The patient's neurological examination revealed early right laseq positive and right abdf frust. The patient underwent L3-L4-L5 stabilization due to spinal stenosis at an another hospital two years ago and TLIF was placed in the L4-L5 disc space. When the patient's images were examined, it was seen that the TLIF was protruding from the L4-L5 disc space. The patient's pre-op lumbar computed tomography (CT) and lumbar magnetic resonance (MR) images are given in Table 1.

Table 1



Pre-op CT and MR images for TLIF malposition

**Findings**: The patient was taken to surgery. The patient's right L4-L5 disc distance was reached. It was seen that the right L5 root was congested and could not be medialized with the dissector. Considering the high risk of damage due to the root expanding outward, it was decided to remove the TLIF transdurally. Similar to spinal tumor surgery, the dura was opened and the TLIF was exposed. It was removed transdurally. No neuromotor deficit was observed in the patient's post-operative examination. The patient's per-operative images are given in Table 2.



Per-op transdural TLIF removal is shown.

**Result**: In spinal surgery, in cases where the risk of neurodeficit development is high in the case of TLIF malposition and the nerve root cannot be medialized, transdural removal should be considered as an option.

Keywords: TLIF malposition, lomber stenosis, transdural

### **Ref No: 4358**

### SPINAL EPIDURAL HAEMATOMA AND CAUDA EQUINA SYNDROME WITHOUT LOWER LIMB MOTOR DEFICIT ON THE 8TH DAY AFTER SPINAL SURGERY: CASE REPORT

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**Aim**: Although postoperative spinal epidural haematoma (POSEH) is a rare complication, it can cause serious neurological complications, with cauda equina syndrome (CES) being one of the most devastating outcomes. CES is characterised by bladder and/or bowel dysfunction, loss of saddle-like sensation and potential neurological deficits in the lower extremities(Lavy et al., 2022). Early diagnosis and treatment of POSEH is important as it may impair the patient's quality of life.Cramer et al. In a study of 11,817 patients, the incidence of significant new onset major neurological deficit immediately after spinal surgery was reported to be 0.0745% (approximately 1 in 1,000) in the lumbar/sacral spine and the most common etiology was epidural haematoma(Cramer et al., 2009). Liu et al. reported that a patient who developed CES after lumbar microdiscectomy showed complete neurological recovery after haematoma evacuation and bladder and bowel functions returned(Liu et al.,

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2025). It has been reported that the incidence rate of clinical POSEH in unilateral biportal endoscopy (UBE) surgery (8.4%) is higher than that in conventional spine surgery (1.4%)(Li et al., 2022). Risk factors associated with POSEH are female gender, advanced age (>70 years), anticoagulant drugs and use of water infusion pump(Kim et al., 2019).The aim of this study is to draw attention to the importance of keeping this rare atypical complication in mind and early treatment after spinal surgery.

**Material and Method**: Case Presentation: A 71-year-old woman was operated with the diagnosis of L2-3, L3-4 spondylolisthesis and spinal stenosis. L2,3,4 stabilisation with cemented polyaxial screws and two-level total laminectomy and foraminotomy were performed with posterior intervention. Intraoperative dura tear developed and dura repair was performed. After one week of drain follow-up, the drain was withdrawn when it decreased to 30 cc per day and the patient was mobilised.

**Findings**: On the 8th day, urinary and faecal incontinence developed and urgent CT and MRI were performed. Epidural haematoma was detected and haematoma was drained in an emergency operation. The urinary catheter was clamped at 4-hour intervals and followed up. On the 2nd day, the catheter and drain were removed after she felt urine. On the 4th day, she reported gas discharge and was discharged without any problem.

a: pre-op images



### b: post-op images



**Result**: This case highlights the importance of recognising CES in patients with isolated urinary dysfunction after lumbar surgery, even in the absence of typical neurological symptoms such as lower limb weakness. Suspecting CES even in atypical presentations may facilitate timely diagnosis and treatment.

**Keywords**: Cauda equina syndrome, spinal epidural haematoma., spine surgery, posterior approache

### Ref No: 4376

# PRIMARY EWING'S SARCOMA OF THE SPINE IN CHILDREN

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**Aim**: Ewing's sarcoma is a primary malignant bone tumor that affects individuals in the second decade of life. Primary sarcomas of the spine are rare and primary Ewing sarcoma of the spine is very rare. There are 2 types of Ewing sarcoma of the spine; Ewing sarcoma of the sacral spine, which is very aggressive and has a poor prognosis, and Ewing sarcoma of the spine. Non-sacral spine sarcoma is extremely rare. The patient may have neurological deficits when the tumor extends into the spinal canal, causing compression of the spinal cord. Magnetic resonance imaging (MRI) is very sensitive in diagnosing the tumor and assessing the size of the tumor.

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### Material and Method: case report

**Findings**: Here, we report a case of a 7-year-old boy who presented with low back pain, weakness in both lower extremities and bilateral spastic paraplegia that had been progressively developing since 1 month. CT and MRI scans showed the presence of a tissue lesion process centered on the T2 vertebral body, heterogeneously enhanced posteriorly after gadolinium injection, without epiduritis, endochannel extension, spinal cord compression and swelling of the posterior wall. The patient underwent surgical decompression with surgical biopsy and posterior stabilization of the spine. Histopathology and immunohistochemistry studies confirmed the diagnosis of Ewing sarcoma and the patient was referred to an oncopediatric center for combined treatment.

### Preop MRI



preoperative MRI section of T2 vertebrea

Postop MRI



### MRI section after surgery

**Result**: Primary Ewing's sarcoma of the non-sacral spine is an extremely rare primary malignant bone tumor that should be suspected in young patients with rapidly worsening low back pain. The diagnosis is guided by imaging and confirmed by histology and molecular biology data. Treatment with multimodal chemotherapy, radiotherapy and surgery at the earliest possible stage improves survival, but the prognosis is poor when the disease is diagnosed at the metastatic stage or when the serum lactate level is low.

### **Ref No: 4431**

# EPIDERMOID CYST MIMICKING COCCYGEAL MENINGOCELE

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**Aim**: Lumbosacral dermal sinus tracts (DST) are epithelial-lined channels that extend from the skin to the spinal cord, categorized as part of spinal dysraphism. They result from incomplete separation between the neural and cutaneous ectoderm during embryonic development, typically found in the lumbosacral region. About 50% of DSTs are associated with dermoid or epidermoid cysts. While generally benign, epidermoid cysts can cause symptoms like pain, recurrent infections, weakness, and urinary or bowel incontinence in the sacral area. These cysts can develop either congenitally or after trauma.

**Material and Method**: This study presents a case of an epidermoid cyst with a dermal sinus tract, initially suspected to be a sacral meningocele.

Findings: A 26-year-old female presented with swelling and pain in the sacrococcygeal region. Her medical history included a childhood fall from a height and scoliosis. On examination, a dimple-shaped skin lesion consistent with a dermal sinus tract was noted in the sacrococcygeal midline. Neurological examination revealed no abnormal findings. Imaging showed a cystic lesion at the distal coccyx extending into the presacral area, initially suspected to be a meningocele (Figure-1). Due to worsening symptoms, surgery was performed. During surgery, fluoroscopy was used to locate the S2-S3-coccyx level, and a vertical skin incision was made to access the area. Under the microscope, a cystic sac surrounded by epithelial tissue was observed. To prevent a potential connection with the spinal canal, the coccyx was tied with a silk suture, and the cyst was accessed from its apex. A yellow-brown, creamy, odorless, puslike liquid was seen (Figure-2). It was discovered that the cyst was connected to the rectum. The cvst was totally resected, and specimens were sent to pathology and microbiology for analysis. The biopsy report confirmed the presence of an epidermoid cyst, with a cystic structure lined by stratified squamous epithelium, a prominent granular layer, sebaceous glands, and keratin in the lumen. No bacterial growth was detected in the culture.

Keywords: ewing's sarcoma, spine, extrasacral, child





Magnetic Resonance Imaging (MRI) images of the Dermal Sinus Tract are shown. A) Axial MRI T1 sequence B) Axial MRI Diffusion C) Axial MRI T2 sequence D) Sagittal MRI T2 sequence **Result**: Epidermoid cysts usually develop when epithelial tissue mistakenly migrates into the dermis after trauma, typically evolving over months or years. In this case, the patient's trauma history and the presence of sclerotic, old fracture-like images in the left alar wing and sacroiliac joint on sacrum CT (Figure-3) offer insights into the pathophysiology. An epidermoid cyst with a dermal sinus tract mimicking spinal dysraphism in the adult sacral region has not been reported in the literature, and this case is presented.





Pelvic Computed Tomography (CT) images are shown. Sclerotic changes are notable in the left alar wing and left sacroiliac joint.

**Keywords**: Spinal Dysraphism, Epidermoid Cyst, Dermal Sinus Tract, Meningocole, Sacrococcygeal Region



A) The lesion, indicated by the arrow, is covered with epithelial tissue. B) The yellow-brown, odorless liquid material inside the lesion is shown.

Figure-2

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### **Ref No: 4946**

### CEREBELLAR MUTISM FOLLOWING CERVICAL SPINE STABILIZATION: A RARE COMPLICATION SECONDARY TO VERTEBRAL ARTERY STENOSIS

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**Aim**: Cerebellar mutism syndrome (CMS), typically associated with posterior fossa surgery in pediatric populations, is extremely rare in adults and seldom reported following cervical spine surgery. We present a unique case of postoperative cerebellar mutism developing after posterior cervical decompression and stabilization in a 71-year-old woman, later attributed to vertebral artery stenosis and cerebellar ischemia (1-2-3).

Material and Method: In this study, a rare complication of cervical transpedicular screw fixation is described through a case presentation. A 71-year-old female presented with cervical myelopathy due to C4-5 listhesis and spinal cord signal changes indicative of myelomalacia. Neurological examination revealed shoulder abduction weakness (3/5) on the left side without additional deficits. The patient underwent C3-7 posterior transpedicular stabilization and C3-5 total laminectomy (Figure 1).Postoperatively, the neurological status remained stable, but on postoperative day 2, the patient developed cerebellar mutism-sudden onset speech loss without cognitive impairment. Diffusion MRI (Figure 2) revealed acute ischemic changes in the left cerebellar peduncle and cerebellum. Digital subtraction angiography (DSA)(Figure 3) showed critical stenosis of the left vertebral artery at the C5 level. Anticoagulant and dual antiplatelet therapy were initiated. By postoperative day 7, the mutism spontaneously resolved. The patient was discharged on conservative follow-up.

Figure 1



Scout CT view demonstrating spinal instrumentation following posterior stabilization surgery

Figure 2



Diffusion-weighted MRI showing acute restricted diffusion in the right cerebellar peduncle and adjacent cerebellar tissue, consistent with ischemia.



Figure 3

The left vertebral artery showed a near-total stenosis at the C5 level, as seen in the DSA images.

**Findings**: This case underscores the potential neurovascular risks in posterior cervical instrumentation, particularly in elderly patients with pre-existing vascular disease. Although cerebellar mutism is well-characterized in posterior fossa tumors, its occurrence following cervical spine surgery is exceptionally rare and likely secondary to hemodynamic compromise of the posterior circulation. In this case, manipulation or positioning may have exacerbated pre-existing vertebral artery stenosis, leading to cerebellar infarction in areas critical for speech output (dentate nucleus and cerebellar outflow tracts). Diffusion restriction on MRI and DSA findings support the vascular etiology of cerebellar mutism. Timely recognition and


medical management prevented permanent sequelae. This case highlights the importance of vertebrobasilar evaluation in patients undergoing upper cervical spine surgery, especially when postoperative neurological changes arise.

**Result**: This is the first reported case, to our knowledge, of cerebellar mutism following posterior cervical stabilization due to vertebral artery stenosis-induced infarction. Surgeons should be vigilant for vascular complications in elderly cervical myelopathy patients and consider cerebrovascular imaging in unexplained neurological deterioration post-surgery.

**Keywords**: Cerebellar Mutism, Transpedicular Screw Fixation, Vertebral Artery Stenosis, Serebellar Ischemia deformity severely impaired his ability to maintain an upright posture, restricted his forward vision, and significantly affected daily activities. Due to these limitations, surgical intervention was planned.In the initial surgery, PSO was performed at the L3 level, along with T6-S1 posterior spinal instrumentation (PSI) and S2 alar screw placement. However, the desired level of correction was not achieved. One year postoperative followup revealed sufficient fusion, but persistent sagittal imbalance. Therefore, a second operation was performed, involving an additional PSO at the L4 level to enhance correction.The patient, now at six months postoperatively, has no active complaints and reports significant improvement in posture and quality of life.

X-RAY



CT OF FUSION



Findings: Surgical treatment of progressive kyphosis related

#### **Ref No: 5429**

#### BEYOND THE LIMITS: CONSECUTIVE LEVEL PEDICLE SUBTRACTION OSTEOTOMIES FOR SEVERE ANKYLOSING SPONDYLITIS

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**Aim**: Ankylosing spondylitis (AS) is a chronic inflammatory disease primarily affecting the axial skeleton, potentially leading to progressive thoracolumbar kyphotic deformity. This condition significantly impacts posture, mobility, and quality of life. Structural changes in AS may cause severe sagittal imbalance and flexion contracture deformities, resulting in chronic back pain, loss of horizontal vision, and neurological deficits. Various osteotomy techniques are used to manage severe kyphotic deformities, with pedicle subtraction osteotomy (PSO) being the preferred method due to its superior corrective ability. Here, we present a case of severe AS related kyphotic deformity managed with consecutive PSO procedures. By discussing surgical planning, perioperative challenges, and postoperative outcomes, we aim to contribute to the management strategies for AS related kyphotic deformities.

**Material and Method**: A 61 year old male with a history of AS presented with severe back and lumbar pain and progressive kyphosis. Radiological examinations revealed an 80° thoracolumbar kyphosis on lateral scoliosis radiography. The

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with AS requires a tailored approach to determine the optimal procedure and levels of intervention. Two-level PSO offers greater angular correction but also increases the risk of complications. In this case, a single level PSO did not achieve adequate correction, necessitating a second procedure. The necessity of a staged approach underscores the importance of preoperative planning and close postoperative monitoring.

**Result**: This case emphasizes the significance of individualized surgical planning for progressive kyphosis related with AS . While a single-level PSO was initially performed, additional correction was required, leading to a second PSO at a consecutive level. Surgical decisions should integrate clinical and radiological findings along with patient complaints. Our findings highlight that alternative approaches beyond standard procedures may be necessary in select cases.

**Keywords**: ankylosing spondylitis, kyphosis, pedicle subtraction osteotomy

## Ref No: 5461

# THE EFFECT OF BRACE TREATMENT ON QUALITY OF LIFE IN ADOLESCENT IDIOPATHIC SCOLIOSIS

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**Aim**: Our study aims to evaluate the quality of life in adolescent idiopathic scoliosis patients treated with brace and to examine the relationship between quality of life and clinical factors related to brace treatment.

**Material and Method**: This cross-sectional study included 19 patients who came to Ondokuz Mayıs University Faculty of Medicine Hospital and were diagnosed with idiopathic scoliosis. The quality of life of patients who received brace treatment was evaluated with Scoliosis Research Society 22 questionnaire (SRS-22) before and after treatment. In addition, age, period

of follow up, degree of cobb angle, the success rate of brace treatment, duration of brace use, and compliance with brace treatment were recorded as clinical factors related to brace treatment.

**Findings**: The study was completed with 19 participants with a mean age of  $15.3 \pm 1.4$  and a gender ratio of 0.19 (M/F). Self-image, mental health and total score quality of life were significantly improved after more than  $2.4 \pm 0.3$  years follow-up after brace treatment (p < 0.05). We found significant relationships between cobb angle and percentage of correction brace with self-image, mental health, function and total score of quality of life (p < 0.05). Also there were significant relationship between compliance and self-image, mental health and total score of quality of life (p < 0.05).

Domain (range 1-5)	In-Brace Initial Visit	After Brace Treatment	р
Function/ Activity	4.34±0.48	4.35±0.50	0.96
Pain	4.02± 0.66	4.04±0.48	0.90
Self-image	4.04± 0.76	4.35±0.56	0.03*
Mental Health	4.04±0.48	4.49±0.50	0.02*
Satisfaction with manag- ment	3.77±0.60	3.68±0.46	0.85
Total score	4.16±0.66	4.34±0.60	0.04*

Table 1. Comparison of Quality of Life According to SRS-22Between In-Brace Initial Visit And After Brace Treatment

**Result**: Quality of life improves in AIS patients who receive brace treatment. In addition, long-term quality of life outcomes are related to cobb angle, percentage of correction brace and compliance.

**Keywords**: Adolescent Idiopathic Scoliosis, Brace, Quality of Life

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## **Ref No: 5505**

#### SURGICAL TREATMENT OF PROGRESSIVE SCOLIOSIS AND NEUROLOGICAL DEFICIT IN TWO PATIENTS WITH STUVE-WIEDEMANN SYNDROME: A CASE REPORT

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**Aim**: Stüve-Wiedemann syndrome is a rare autosomal recessive disorder characterised by severe bowing of the long bones, progressive scoliosis, respiratory distress and recurrent episodes of hyperthermia, often leading to early infant mortality.

**Material and Method**: We are following five children with this condition who have been followed from birth and survived to term, with an average age of 7 years. Two of these patients were operated for progressive spinal deformity and acute paraplegia and were included in the study

Findings: Case 1: A 14-year-old male with Stuve-Wiedemann syndrome was diagnosed with progressive rigid thoracic kyphoscoliosis at the age of 11. Despite initial observation and nonsurgical treatment, the deformity progressed and worsening neurological symptoms developed, including motor weakness (lower extremitymuscle grading was 1-2/5) and sensory deficits (grade 1 - impared). Imaging showed that the scoliosis curve was 47 degrees and the kyphosis curve was 81 degrees. Given the progressive nature of the deformity and the onset of paraplegia, the patient underwent emergency spinal correction and fusion surgery. The patient underwent C7-L1 posterior instrumentation and multi-level decompression. In the early postoperative neurological examination, both motor(lower extremity muscle grading was 4/5) and sensory examinations (grade 2) were better.Case 2: A 13-year-old male with a similar history presented with severe rigid toraco-lumbar kypho-scoliosis and worsening neurological symptoms developed, including motor weakness and sensory deficits. He was diagnosed with acute paraplegia, and emergency surgical intervention was deemed necessary to preventfurther neurological deterioration. Preoperative imaging revealed that the scoliosis curve was 75 degrees and the kyphosis curve was 39 degrees. The patient underwent T2-S2 iliac posterior instrumentation, T12 posterior vertebral column resection and multi-level decompression. In the early postoperative neurological examination, both motor and sensory examinations were better.

Vaka Örneği



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**Result**: Progressive scoliosis and related neurological deficit in Stuve-Wiedemann syndrome presents a significant challenge for both diagnosis and treatment. Progressive rigid and long segment curvatures with associated canal stenosis are typical in this syndrome. Due to the potential for rapid progression and associated neurological complications, early surgical intervention is critical. In our cases, timely correction of the scoliosis helped to prevent further neurological deterioration. This case report highlights the importance of close monitoring and early intervention inpatients with Stuve-Wiedemann syndrome who develop scoliosis.

**Keywords**: Rigid thoracic kypho-scoliosis, Stuve-Wiedemann Syndrome

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### PREGNANCY AND LACTATION-ASSOCIATED OSTEOPOROSIS: A CASE REPORT OF MULTIPLE VERTEBRAL FRACTURES IN A PRIMIGRAVIDA TWIN PREGNANCY

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**Aim**: Pregnancy and lactation-associated osteoporosis (PLO) is a rare but clinically significant condition that may lead to severe bone demineralization and fragility fractures, particularly in primigravida patients with multiple gestations. The clinical presentation is often nonspecific, leading to diagnostic delays and increased morbidity. This case report aims to emphasize the importance of considering PLO in postpartum women presenting with severe back pain and to discuss its diagnostic challenges and therapeutic approach.

Material and Method: A 28-year-old primigravida woman with a twin pregnancy presented to our clinic in the third month postpartum with progressively worsening lumbar and thoracic pain, which had initially developed in the third trimester and intensified after delivery. A comprehensive diagnostic workup, including spinal radiography, magnetic resonance imaging (MRI), and dual-energy X-ray absorptiometry (DXA), was conducted to assess vertebral integrity and bone mineral density (BMD). Laboratory investigations were performed to exclude secondary causes of osteoporosis. The patient underwent a multidisciplinary management strategy involving orthopedic, endocrinological, and rehabilitation interventions. Initial conservative treatment included the application of a Jewett hyperextension brace for six weeks to provide spinal stability. Subsequently, a structured physical therapy regimen focusing on postural correction, core stabilization, and spinal strengthening was initiated. Pharmacological management comprised daily subcutaneous administration of 20 mcg teriparatide, in addition to calcium supplementation (1000 mg/day) and cholecalciferol (20,000 IU twice weekly).

**Findings**: Imaging studies identified multiple osteoporotic vertebral compression fractures, predominantly affecting the lumbar spine (L1-L5) and thoracic vertebrae (T6, T7, T9, T11, and T12), with the most pronounced involvement at T9. Fractures were classified as OF Type 1 and Type 2, with a combination of acute (edematous on MRI) and chronic features. DXA measurements revealed severely reduced BMD, with lumbar vertebral T-scores of L1: -4.9, L2: -5.7, L3: -5.1, and L4: -5.5.

During follow-up with the treatment, the patient demonstrated significant clinical improvement. By the three-month followup MRI, no new acute fractures were observed. The patient reported progressive alleviation of symptoms, improved functional capacity, and enhanced mobility following continued pharmacological intervention and physical rehabilitation.

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Thoracal MRI at the prensentation 3th month Thoracal T2 Stir MRI Sequence



3th month of treatment

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**Result**: PLO should be considered in the differential diagnosis of postpartum women, particularly those with multiple gestations, presenting with persistent back pain. Early recognition and timely radiological assessment are crucial for preventing misdiagnosis and avoiding progressive vertebral fractures. This case underscores the necessity of a multidisciplinary therapeutic approach incorporating orthopedic stabilization, structured rehabilitation, and targeted pharmacological therapy to optimize clinical outcomes and prevent long-term disability.

**Keywords**: Pregnancy and lactation-associated osteoporosis (PLO), Postpartum back pain, Multiple gestation, Primigravida, Osteoporotic Vertebral Compression Fractures, Teriparatide therapy outcomes. These technologies enable real-time, remote assessments, offering an accessible, cost-effective alternative to traditional labs.

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**Result**: Integrating AI into biomechanical evaluation presents a promising step forward in LBP physiotherapy, supporting more objective, data-informed interventions. However, further clinical validation is needed to ensure effectiveness across diverse patient populations and real-world conditions.

**Keywords**: Low back pain, World health organization, Artificial intelligent

#### **Ref No: 7205**

#### ARTIFICIAL INTELLIGENCE IN BIOMECHANICAL MOTION ANALYSIS FOR LOW BACK PAIN: A NARRATIVE REVIEW

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**Aim**: Low back pain (LBP) is the leading cause of disability worldwide, affecting over 619 million individuals as of 2020, with projections exceeding 843 million by 2050 (WHO, 2023). Accurate biomechanical assessment plays a vital role in guiding physiotherapy, yet traditional tools are often costly and restricted to lab environments. This review explores the emerging role of artificial intelligence (AI) in analyzing movement biomechanics in individuals with LBP, focusing on its potential to enhance clinical decision-making and personalize rehabilitation.

**Material and Method**: A systematic literature search was conducted across PubMed, Scopus, and IEEE Xplore, targeting studies from 2018 to 2024 that utilized machine learning (ML) and deep learning (DL) techniques for motion analysis. Included works employed video-based systems and wearable sensors to assess posture, functional movements, and gait.

**Findings**: Findings indicate that Al-driven tools—such as OpenPose and Mediapipe—achieve over 85% accuracy in classifying movement patterns and predicting treatment

## Ref No: 7322

#### A CASE OF THORACIC SCHWANNOMA: CLINICAL FINDINGS, DIAGNOSIS, AND TREATMENT PROCESS

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**Aim**: This report presents a patient diagnosed with a rare intradural intramedullary schwannoma, discussing the clinical, radiological, and pathological evaluation, as well as the surgical treatment and postoperative recovery process. It particularly emphasizes how early diagnosis and timely surgical intervention can significantly improve the patient's neurological function.

**Material and Method**: Schwannomas are tumors originating from Schwann cells and are typically located intradurally and extramedullary. However, they can rarely have an intramedullary location. Due to their rarity, intramedullary schwannomas pose diagnostic and therapeutic challenges. This case highlights the diagnosis and treatment process of a rare intradural intramedullary schwannoma and discusses its clinical implications.

**Findings**: A 57-year-old male patient was admitted with complaints of inability to walk for one week. On physical examination, bilateral lower extremity muscle strength was assessed as 2/5 on the left side and 1/5 on the right side. The Babinski reflex was positive, and the patient was unable to walk unassisted.Advanced imaging with spinal magnetic resonance imaging (MRI) revealed an intradural mass lesion at the T11-T12 level. Contrast-enhanced MRI demonstrated

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contrast enhancement of the lesion. For definitive diagnosis and treatment, the patient underwent surgical intervention.During microsurgical resection, the tumor was completely excised. Histopathological examination confirmed the diagnosis of an intradural intramedullary schwannoma.In the postoperative period, a significant improvement in lower extremity muscle strength was observed. The initial postoperative assessment showed proximal lower extremity muscle strength of 4/5. By the second postoperative week, the patient was able to walk without assistance. These findings suggest that early surgical intervention can lead to favorable functional recovery in such cases.

**Result**: Although intradural intramedullary schwannomas are rare, they may present with progressive neurological deficits. Early diagnosis and surgical intervention are crucial for neurological recovery. This case underscores the clinical characteristics and successful surgical management of a thoracic schwannoma while highlighting the role of early intervention in improving functional outcomes.

**Keywords**: Intradural Intramedullary Schwannoma, Spinal Schwannoma, Thoracic Spine Tumor, Spinal Cord Compression, Neurological Deficit

## Ref No: 7616

#### A RETROSPECTIVE CLINICAL EXPERIENCE OF POSTERIOR INSTRUMENTATION USING LATERAL MASS SCREWS VERSUS PEDICLE SCREWS IN CERVICAL SPINE TRAUMA WITH CONCURRENT DISC INJURY IN 52 PATIENTS

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**Aim**: This retrospective study analyzes 52 patients operated between 2022 and 2024 due to cervical spine trauma with concurrent disc herniation. Patients were divided into two groups based on posterior fixation method: lateral mass screws (Group A) and pedicle screws (Group B). Visual Analog Scale (VAS) scores were used for pain evaluation, and long-term radiological and clinical outcomes were assessed to evaluate effectiveness and implant durability. While no significant difference was found in postoperative pain control, pedicle screw instrumentation demonstrated superior structural effectiveness. However, implant failure was observed more frequently in patients with lateral mass screws, especially in those requiring posterior fixation following anterior discectomy. Cervical spine trauma associated with disc herniation often requires both anterior and posterior instrumentation to ensure spinal stability and neural decompression. While lateral mass screws have been widely used due to their safety and ease of insertion, pedicle screws offer biomechanical advantages in terms of pullout strength and load sharing (2-3). This study compares the clinical and radiological outcomes of these two techniques in a specific patient group with traumatic disc pathology.

**Material and Method**: Fifty-two patients with traumatic cervical disc herniation and posterior instrumentation were included in this retrospective study. Group A (n=26) underwent lateral mass screw fixation, while Group B (n=26) received pedicle screw fixation. All patients underwent anterior discectomy prior to posterior instrumentation. Postoperative VAS scores, instrumentation integrity, and follow-up imaging over a 12-month period were analyzed (5).

**Findings**: VAS scores improved significantly in both groups postoperatively, with no statistically significant difference between the groups (p > 0.05), suggesting similar outcomes in pain control. However, pedicle screw instrumentation (Group B) demonstrated superior mechanical stability and less sagittal plane displacement on follow-up radiographs (p < 0.05) (4). Implant failure, such as screw loosening or rod migration, occurred more frequently in the lateral mass group, especially in patients who had prior anterior discectomy (p < 0.01) (1).

Figure 1



Preoperative Sagittal and Axial MRI image showing traumatic cervical disc herniation with spinal cord compression at the C4-5 level.

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Postoperative X-ray lateral and CT scan Axial showing lateral mass screw placement at C3-4-5 levels. Loosening and minor malposition are observed at the C3 level over time.

Statistical Table

Paramater	Group A (Lat- eral Mass)	Group B (Pedicle)	P-value
VAS Score Improvement	6.2	6.5	> 0.05
Implant Fail- ure (%)	26.9	7.7	< 0.01
Sagittal Devi- ation (mm)	3.1	1.2	< 0.05
Follow-up Duration (months)	12	12	NS

**Result**: Pedicle screw fixation is a more effective technique in terms of long-term stability in cervical trauma cases with accompanying disc herniation, despite the technical difficulty and risk profile. Lateral mass screws, while easier to apply, may be associated with higher implant failure rates when used following anterior procedures. Clinical decision-making should consider patient-specific anatomical and pathological factors.

**Keywords**: Cervical Spine Trauma, Lateral Mass Screws, Pedicle Screws, Implant Failure, Visual Analog Scale (VAS)

## Ref No: 7641

## A RARE COMPLICATION FOLLOWING CERVICAL Syringomyelia Surgery: T-Tube Migration

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**Aim**: Implant migration after cervical syrinx surgery is a rare but serious complication. This case report aims to present a patient who undergo surgery for cervical syrinx, had a T-tube implanted, and later developed tube migration, leading to neurological deterioration.

Material and Method: A 22-year-old female patient undergo surgery for cervical syrinx five years ago, during which a T-tube was placed for drainage. Over the past two years, she experienced progressively worsening neck pain, numbness in both upper and lower extremities, muscle weakness, and balance impairment. Additionally, she reported occasional difficulty with fine motor skills and an increasing sense of instability while walking. Neurological examination revealed mild muscle weakness, hyperreflexia in deep tendon reflexes, and reduced proprioception in her lower limbs.Cervical spinal magnetic resonance imaging (MRI) and computed tomography (CT) scans revealed that the earlier placed T-tube had migrated inferiorly from its original surgical position. This migration was identified as the reason for the patient's worsening symptoms. The displacement was thought to have caused progressive compression of the spinal cord, contributing to her worsening neurological condition. The patient was reevaluated for surgery, and revision surgery was planned to reposition or remove the migrated implant





Figure 1: a.Pre-operative MRI b.operated zone c.migrate t-tube



**Findings**: T-tubes and other implants are frequently used in cervical syrinx surgery to maintain cerebrospinal fluid drainage and prevent fluid accumulation. However, these implants carry a risk of displacement over time due to mechanical forces and physiological movements. Although T-tube migration is rare, it can lead to progressive neurological symptoms, including worsening pain, sensory deficits, and motor dysfunction. In this case, the migration of the T-tube contributed to the patient's deteriorating neurological status, necessitating surgical intervention. Early diagnosis and timely surgical management are essential in such cases to prevent further complications.

**Result**: Implant migration following cervical syrinx surgery is a significant complication that can lead to severe and progressive neurological symptoms. Close postoperative follow-up, with routine imaging, plays a key role in detecting early signs of migration. In cases where migration occurs, prompt surgical intervention should be considered to prevent further neurological decline and improve patient outcomes.

Keywords: cervical syrinx, t-tube

trends, keywords, authors, citation bursts, co-citation statuses, and research clustering hotspots. Network maps were created to evaluate collaborations between different authors, countries, and institutions. The data collection process was carried out with the keywords ("pathologic vertebral fractures" OR "pathologic spine fractures") based on the readings. The data was limited by selecting "article" as the type and human health sciences as the subject scope. The time range was selected as 1980 – 2025. The metadata of 637 articles was downloaded and the analyses were performed.

**Findings**: The top 3 journals contributing the most to the literature were Spine (45 publications, 1284 citations), Europan Spine journal (17 publications, 332 citations) and Spine Journal (17 publications, 192 citations). A total of 3537 authors were evaluated and Ron N. Alkalay wrote the most publications with 7 publications, and Maximilian F. Reiser received the most citations with 4 publications and 29 citations. While the USA was the country with the most publications with 247 publications, there were 17 studies from Turkey.

Frequency of occurrence of most frequently used keywords by authors



# Frequency of occurrence of most frequently used keywords by

authors

**Result**: In this study, the international and our country's data on Pathological Vertebra Fractures publications were examined. Bibliometric analyses show that fundamental topics such as spine, osteoporosis, vertobroplasty and pathological fractures are prominent. The USA stands out in terms of the number of publications and citations, followed by Germany and China in terms of the number of publications.

**Keywords**: Pathological Vertebral Fractures, Bibliometric, Trauma, Trends

## **Ref No: 9130**

## PATHOLOGICAL VERTEBRAL FRACTURES: BIBLIOMETRIC ANALYSIS OF SCIENTIFIC TRENDS AND DEVELOPMENTS FROM 1980 TO 2025

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**Aim**: Pathological vertebral fractures (PVF) have always been a topic of interest for researchers because they are a serious public health problem. The aim of the study is to identify prominent trends in PVF research. It is aimed to present a panorama of the research area through prominent concepts, names, trends, tendencies, and citation analyses in the studies under this title.

**Material and Method**: Publications on pathological vertebral fracture research were scanned in the Web of Science (WoS) database between 1984 and 2024. VOSviewer and R Studio Biblioshiny software were used to analyze the data and create visual information maps. The analyses included annual publication

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## **Ref No: 9204**

# THORACIC VERTEBRA SYNOVIAL SARCOMA: A RARE CASE REPORT

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**Aim**: Synovial sarcoma (SS) is a rare soft tissue tumor with spinal involvement. Unlike other soft tissue tumors, it tends to occur at a younger age. SS typically progresses slowly and asymptomatically in the spine, but depending on its location, it may cause neurological deficits due to compression effects. Since it must be differentiated from metastatic tumors and other malignancies, histological examination is essential for a definitive diagnosis.

**Material and Method**: A 37-year-old male patient presented with a two-month history of back pain. He had a known diagnosis of morbid obesity but no other comorbidities. Neurological examination revealed no abnormalities. Thoracic computed tomography (CT) and magnetic resonance imaging (MRI) demonstrated a mass in the T9 vertebral body, destructing the posterior elements, narrowing the spinal canal, and extending into the pleura of the right hemithorax. Due to its invasive nature and compressive effect on the spinal canal, surgical intervention was performed. Under intraoperative neuromonitoring, the patient underwent right hemilaminectomy, partial corpectomy, subtotal excision of the extradural mass, and posterior stabilization.



Figure 1

Figure 2



Preoperative BT images and postoperative BT images

**Findings**: Histopathological examination confirmed the diagnosis of synovial sarcoma. The patient had no postoperative neurological deficits. After wound healing was complete, he was referred for adjuvant chemotherapy and radiotherapy for residual tumor treatment. No recurrence was observed during the one-year follow-up.

**Result**: Synovial sarcoma is a rare mesenchymal malignancy, accounting for less than 10% of all soft tissue neoplasms. It should be considered in the differential diagnosis of spinal masses.

Keywords: Synovial sarcoma, spinal tumor

Preoperative MRI images

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### **Ref No: 9769**

# A CASE OF PSEUDOMENINGOCELE DEVELOPED AFTER LUMBAR DISC HERNIATION SURGERY

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**Aim**: Introduction:Pseudomeningocele is a rare complication that may arise following spinal surgery. Although cervical pseudomeningoceles are more frequently reported in the literature, iatrogenic dural injuries in the lumbar region are considered to be less commonly encountered due to easier access for primary repair within the larger surgical field and reduced cerebrospinal fluid (CSF) pressure caused by lumbar immobilization. However, when pseudomeningocele develops, intracranial hypotension and its clinical manifestations may occur.

**Material and Method**: Excision of the lumbar pseudomeningocele and primary dural repair via surgical intervention

Findings: Case Presentation: A 31-year-old female patient presented to our clinic with a history of lumbar disc herniation surgery performed 6 and 2 years ago. She reported orthostatic headache, nausea, vomiting, and a fluctuant swelling over the surgical site without any wound leakage. Additionally, she had radicular pain corresponding to the left L4-5 level. On examination, there was no neurological deficit or signs of meningeal irritation. Laboratory tests showed no evidence of infection. Lumbar MRI revealed a 105×72×65 mm lesion, hyperintense on T2 and hypointense on T1 sequences, isointense with CSF, extending from the spinal canal through the paravertebral muscles into the subcutaneous tissue-indicative of a lumbar pseudomeningocele. The patient was scheduled for surgery. Intraoperatively, CSF leakage was observed from the subcutaneous tissue. A fibrous capsule surrounding the long-standing pseudomeningocele was noted. A 1.5 cm dural defect caused by continuous CSF drainage was identified. Using a drill, the lamina defect was enlarged until intact dura was visualized. The defect was primarily repaired and reinforced with synthetic dural graft, tissue adhesive, and fat graft harvested from the surgical site. The patient remained immobilized for 12 hours postoperatively, after which she was mobilized. Postmobilization, her radicular pain and symptoms of intracranial hypotension resolved completely.

figure 1

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Preoperative lumbar MRI scans: sagittal and axial T2-weighted images

figure 2



Preoperative lumbar MRI scans sagittal T1-weighted image and lumbar plain radiograph.

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figure 3



MRI sections obtained prior to the revision surgery for recurrent left L4–5 disc herniation performed two years ago.

**Result**: Conclusion:Pseudomeningocele leading to intracranial hypotension is a rare but noteworthy complication following lumbar disc surgery. It should be considered during postoperative follow-up, as it may necessitate surgical intervention due to potential neurological deficits caused by mass effect.

**Keywords**: Pseudomeningocele, Intracranial Hypotension, Lumbar Disc Herniation

## **Ref No: 9998**

## **VERTEBRAL CYST HYDATID: CASE REPORT**

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**Aim**: Hydatid cyst is a zoonotic infection caused by the parasite Echinococcus granulosus. Although liver and lung involvement is common, bone involvement may also occur.

Material and Method: A 58-year-old woman presented with severe pain in her back. She had no known comorbidities. 8 years ago, she had a history of operation in an external centre for thoracic fracture. Her mobilisation was restricted due to severe pain. Neurological examination revealed no significant laterising findings. Thorocolumbar magnetic resonance imaging (MRI) showed a lesion extending to the paravertebral area with solid and cystic components and intense contrast enhancement. Metallic fixation from the previous operation was present. Considering hydatid cyst in the foreground, albendazole treatment was started with the recommendation of general surgery. After 4 weeks of medical treatment, surgery was planned. Paraparesis (muscle strength was 2/5) developed in the 2nd week of treatment. A new MRI showed that the paravertebral hydatid cyst had shrunk, but since there was an epidural abscess extending along the T8-10 vertebral level, decompression with T8-9-10-11 laminectomy was performed under emergency conditions and the epidural abscess was drained and then posterior stabilisation was performed.

FIGURE 1



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Preopetative MR image

Figure 2



Intraoperative epidural abscess image





Postoperative computed tomography image

**Findings**: Intraoperative pathology result was reported as hydatid cyst. Albendazole treatment was continued in the postoperative period. The patient was rehabilitated with physiotherapy and improvement in paraperesis (muscle strength 4/5) was observed.

**Result**: Spinal hydatid cyst is a rare clinical condition. It is most commonly observed in the thoracic region (50%). Hydatid cyst of bone develops very slowly in bone and the incubation period extends up to 15 years.Depending on the location of the cyst, symptoms may vary from asymptomatic course to low back pain, paraparesis, urinary and faecal incontinence. Medical agents such as albendazole and mebandazole should be preferred in the postoperative period due to the difficulty of surgical total excision.

Keywords: Spinal hydatid cyst

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