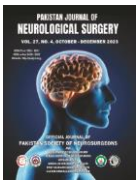

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Original Research

# Evaluation of the Outcome of Transpedicular Fixation for Thoracic and Lumbar Tuberculous Spine Disease

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## ABSTRACT

**Objective:** Pakistan stands sixth in countries, contributing 60% of new TB cases worldwide. TB can involve a wide variety of organs including the spine which at times need neurosurgical intervention. This study aims to determine the overall clinical and radiological outcomes in patients with dorsolumbar spine TB managed by posterior transpedicular screw fixation. The study focused to evaluate the outcome of transpedicular screws fixation for the thoracic and lumbar tuberculous spine.

**Materials and Methods:** The study included a total of 60 patients were observed. A complete history and systemic physical examination was done. Pre-operative anteroposterior and lateral view radiographs were taken to measure the height of the vertebral body, kyphotic angulation, and sagittal plane index. Short-segment transpedicular fixation was done under general anesthesia by consultant neurosurgeons. All patients were asked for follow-up after one month. Post-operative anteroposterior plus lateral view radiographs were done to measure the height of the vertebral body, kyphotic angulation, and sagittal index.

**Results:** In our study mean age was 47 years. 58%patients were males and 42% of patients were female. The mean postoperative vertebral height was 18.93 mm ± 1.17 and the mean postoperative Kyphotic angle was 9.68 degree ± 4.03º. The mean postoperative Sagittal index was 5.83 ± 4.55.

**Conclusion:** The outcome of transpedicular fixation of vertebral height was 18.93 mm ± 1.17, Kyphotic angle was 9.68 degree ± 4.03º) and Sagittal index was (5.83 ± 4.55) for thoracic & lumbar tuberculous spine.

**Keywords:** Pott's, Transpedicular Fixation, Thoracic, Lumbar Tuberculous Spine, Sagittal Index.

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## INTRODUCTION

The 9th leading cause of death in the world is TB. WHO announced 1.3 million deaths due to HIV-

negative TB in 2017.[1] Pakistan stands sixth in countries, contributing 60% of newly diagnosed TB cases worldwide.[2-3] Although skeletal TB is not common it is a frequent entity of extrapulmonary tuberculosis. It comprises 10-20% of all extra-pulmonary TB and contributes 1-2% of overall TB cases. Of all musculoskeletal TB, spinal TB constitutes approximately half of the cases.[4] Vertebral infection is always caused by hematogenous extension from the primary source.[3] Pott's spine is inert and its growth is slow and can be diagnosed based on clinical and radiological examinations in endemic areas.[5,6] The thoracic vertebra was found to be the most involved one followed by the lumber vertebra.[1] Back pain is the most presenting symptom along with other symptoms such as weight loss, anorexia, pyrexia, and lethargy. The clinical presentation of Pott's disease depends on the severity and duration of the lesion, the location of the disease, and associated complications like abscess, sinus discharge, instability, and neurologic weakness.[3] Pott's disease is frequently observed in younger patients, causing kyphotic deformity and lower limb weakness, having a high disability rate making it difficult to eradicate. Dorsal Spine (40% to 50%), lumbosacral (35% to 45%), and neck (10%) vertebra are frequent spots for infection.[7] The typical Spine TB is well-described, easily diagnosed, and managed.[8,9] Atypical TB is relatively not common, mimicking low-grade bacterial infection, brucellosis, and spondylitis secondary to sickle cell disease, hydatid cyst, lymphomas, and malignancy and are hard to recognize and manage in the initial stages with great chances of neurologic deficits.[10,11] Exploration causes the reactivation of Pott's disease in 30% – 40% of cases. Severe symptomatic spinal stenosis and calcification of the ligamenta flava adjacent to severe kyphotic deformity may cause an incomplete neurologic weakness.[12,13] Computed Tomography can demarcate bony destruction very early. Lesions smaller than 15mm are well recognized than on simple X-ray, but their sensitivity is low in delineating the extradural spread of the disease. Bony erosion with a paraspinal abscess showing the expansion of bone with abnormal bone or ossification is supposed to be a sign of a Potts disease.[14,15]

However, the Investigation of choice is MRI rather than plain X-ray.[16] The hypointense on T1-weight images and the hyperintense on T2-weight images in involved vertebrae, the relative disc preservation, the septa formation para and prevertebral or intra-vertebral abscess with a sub ligamentous spread and extending to extradural space are all typically visualize on MRI.[17,18] In 90% of Pott's disease, there is a well-formed paravertebral abscess formation but not in bacterial spondylitis.[19,20] Early-recognized spine TB is treated conservatively with anti-TB chemotherapy and immobilization. If patients are refractory to conservative treatment or develop neurologic weakness, kyphotic deformity, or instability, surgery is the mainstay of treatment.[21] Non-surgical treatment has a mean deformity rise of 15° and greater than 60° of ultimate deformity in 3% – 5% of patients.[22,23] The management of treatment aims at debriding the infection, restoration of neurological function, correction of spine deformity, and improving the quality of life. Different surgical procedures (such as posterior, anterior, and combined and 2-stage procedures) have been applied so far. To date, the posterior approach for treating spinal TB had been famous since it is the least destructive and can be extended above and below the affected levels, and provides a strong 3-column fusion through unaffected posterior elements via pedicular screws. Posterior laminectomy and instrumental fixation are effective and safer procedures for the surgical treatment of dorsal and lumbosacral Pott in adults.[24]

Studies on the outcome of transpedicular fixation in spinal fractures secondary to trauma have shown significant radiological improvement. A cross-sectional study including 161 patients,

with a preoperative average vertebral height of 9.42 mm, mean kyphotic angle of 23.06 degrees and average sagittal index of 19.38 degrees resulted in postoperative average vertebral height of 19.64 mm, average kyphotic angle correction of 9.45 degrees and reduction of sagittal index to an average of 5.41 degrees from 19.38 degrees respectively, showing the achievement of stable fracture segment and hence the prevention of secondary spinal deformities.[25]

Our study was designed to evaluate the outcome of pedicle screw fixation of the thoracic and lumbar tuberculous spine in terms of improvement of kyphotic angulation, vertebral column height, and sagittal index. The purpose of this study is to determine the overall clinical and radiological outcomes in patients with dorsolumbar spinal tuberculosis treated by posterior transpedicular screws fixation of the spine. The results would add to the existing body of knowledge and would be helpful for local practitioners and planners of health to devise meaningful interventions.

## MATERIALS AND METHODS

### Study Design & Setting

A Quasi-experimental study was conducted at the Department of Neurosurgery, Ayub Medical Complex Abbottabad for six months from 4/3/2019 to 4/9/2019.

### Sample Size & Technique

The sample size was 60. The sample size was determined using the WHO formula for sample size calculation with the following assumptions: statistical significance 5%, statistical power 80%, anticipated mean, and SD of per operative vertebral height was 9.42 ± 1.89 mm, and anticipated mean and SD of post-operative vertebral height 19.46 ± 1.19 mm. We considered the total Enumerative sampling.

### Inclusion Criteria

The study included patients of either gender, aged between 13 – 60 years having thoracic and lumbar spinal fractures with single-level involvement secondary to spinal tuberculosis.

### Exclusion Criteria

Patients with multiple-level spinal tuberculosis and those with traumatic spinal fractures are not included in the study. Moreover, patients with spinal fractures at other levels and the ones previously operated for spinal trauma are also not included in the study.

### Data Collection

Approval was obtained from the hospital's ethical committee. All patients meeting the exclusion and inclusion criteria admitted to the ward were enrolled in the study. The pros and cons of the surgery were explained to the patients and they were counseled that their confidentiality was preserved and informed consent was taken. Demographic characteristics like name, age, gender, and address were recorded. Detailed history and clinical examination were done. Preoperative anteroposterior and lateral view radiographs were taken preoperatively to measure vertebral body height, kyphotic angulation, and sagittal index. Short-segment transpedicular fixation was done under general anesthesia by consultant neurosurgeons. All patients were asked for follow-up after one month. Post-operative anteroposterior and lateral view radiographs were done to measure vertebral body height, kyphotic angle, and sagittal index. Outcome along with other information was recorded throughout the study period on a proforma by the trainee.

### Data Analysis

Using SPSS version 26.0 the data was analyzed and the Mean ± SD was calculated for continuous

variables like patients' age and outcome variables like the height of the vertebral body, kyphotic angulation, and sagittal index. For categorical variables i.e. gender, location frequencies, and percentages were calculated. Paired t-test was used to determine the significant difference between pre and postoperative outcome variables. The p-value was maintained as significant at 0.05. Tables were used to display all of the results.

## RESULTS

### Age and Gender Distribution

In this study, a total of 60 patients were analyzed and the mean age was 47 with standard deviation ± 8.26. Of these, 35 (58%) patients were male while 25(42%) patients were female.

### Spine Level Involvement

Location of the tuberculous spine showed that 19 (32%) patients had a thoracic tuberculous spine, 13 (22%) patients had a lumbar tuberculous spine (Figure 1), and 28 (46%) patients had a thoracolumbar tuberculous spine (Table 1).

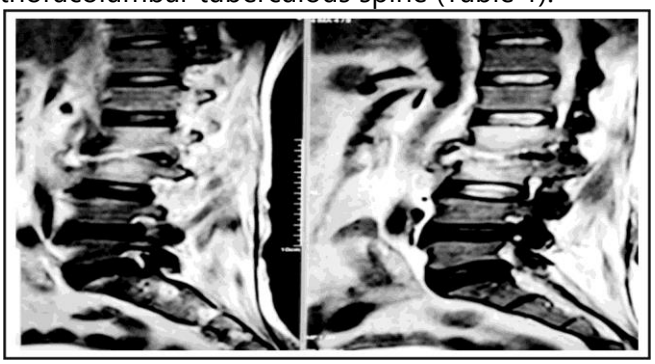

**Figure 1:** The spondylodiscitis at L2-L3 level. (The image is included with the patient's permission).

**Table 1:** Location of Tuberculous Spine (n=60).

| Location | Frequency | Percentage |
|---|---|---|
| Thoracic | 19 | 32% |
| Lumbar | 13 | 22% |
| Thoracolumbar | 28 | 46% |
| **Total** | **60** | **100%** |

### The Outcome of Transpedicular Fixation

The outcome is assessed in terms of vertebral height, kyphotic angulation, and sagittal index. The outcome of transpedicular fixation is shown in Table 2.

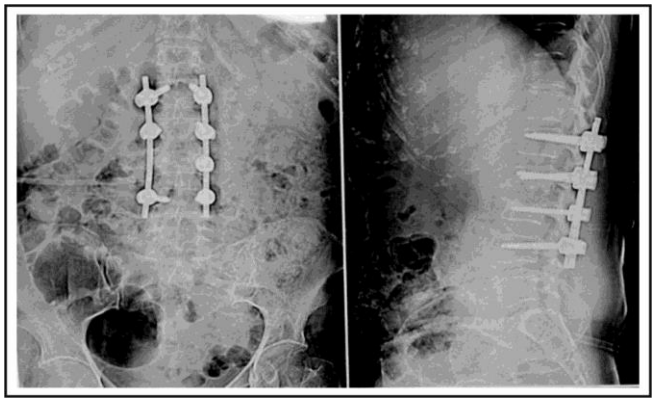

**Figure 2:** Long segment (L1 to L4) transpedicular fixation for L2-L3 Tuberculous Spine. (The image is included with the patient's permission).

### Vertebral Height

Vertebral height was analyzed as mean pre-operative vertebral height was 9.34 ± 1.74 mm while mean postoperative vertebral height was 18.93 ± 1.17 mm (p-value 0.0001) meaning a significant improvement in preoperative and postoperative vertebral height.

### Kyphotic Angulation

Pre-operative mean kyphotic angulation was 23.52 ± 3.94º while the post-operative mean kyphotic angle was 9.68 ± 4.03º (p-value 0.0001) showing a significant improvement in kyphotic angulation.

### Sagittal Index

The mean pre-operative Sagittal index was 20.09 ± 3.99 while the mean postoperative Sagittal index was 5.83 ± 4.55 (p-value is .0001) demonstrating improvement in postoperative vertebral height as shown in Table 2.

**Table 2:** Outcome of Transpedicular Fixation (n = 60).

| Outcome | Pre-Operative | Post-Operative | P value | t Test value |
|---|---|---|---|---|
| Vertebral height (mm) | 9.34 ± 1.74 | 18.93 ± 1.17 | 0.0001 | 34.83 |
| Kyphotic angle (degrees) | 23.52 ± 3.94 | 9.68 ± 4.03º | 0.0001 | 30.72 |
| Sagittal index | 20.09 ± 3.91 | 5.83 ± 4.55 | 0.0001 | 37.04 |

## DISCUSSION

Our study shows that the mean pre-operative vertebral height was 9.34 mm ± 1.74 while the mean postoperative vertebral height was 18.93 ± 1.17 mm showing a significant improvement. The mean pre-operative Kyphotic angle was 23.52 ± 3.94 degrees while the mean postoperative Kyphotic angle was 9.68 ± 4.03 degrees which clearly showed a significant reduction in kyphosis. The mean pre-operative Sagittal index was 20.09 ± 3.99 while the mean post-operative Sagittal index was 5.83 ± 4.55 demonstrating improvement.

The same results were observed in another study carried out by Haq et al,[25] with 161 patients, showing preoperative vertebral improvements from 9.42 mm to 19.64 mm, kyphotic angle correction of 9.45 degrees, and a reduction in the sagittal index from 19.38 to 5.41 degrees, demonstrating stable fracture segment and preventing secondary spinal deformities.

Helton et al,[26] reported that the sagittal index of injured vertebral segments was improved from 20.67° to 11.22° postoperatively and 14.22° at late evaluation. Fractured vertebral body compression decreased from 28.81 to 15.59 postoperatively and 25.9 at late evaluation. Intervertebral disk heights changed preoperatively, postoperatively, and at late evaluation.

Arif et al,[27] included 76 patients with various fractures (36 from accidents, 28 from falls, and 12 from heavy objects). Preoperative kyphosis averaged 27°, reducing to 7° postoperatively, and the sagittal index averaged 26° preoperatively, decreasing to 12° postoperatively. A year after surgery, more than half of the patients were pain-free, while 2.6% had moderate to severe pain. Most (52.6%) returned to their previous jobs, but 13.1% could not work. Complications included infection in 10.5% of patients, screw and rod issues in a few, and one case of deep vein thrombosis.

Another study conducted by D'souza et al,[28] reported that the patient's mean age and kyphotic angle were 43.9 years and 21.61 ± 3.72 degrees respectively. Postoperatively kyphotic angle improved to 5.79 ± 3.48 degrees. The average follow-up duration was 24 months, and ultimate kyphosis improvement was obtained at 8.74 ± 3.64 degrees. 80.5% of cases obtained bony fusion. 11 patients had neurologic weakness, and all of them improved. Postoperative all patients had VAS improvement from 9.52 to 2.57.

It was also reported by Zhi-Win Luo et al,[29] in which a total of 161 patients took part in that study. The study included 92 males and 69 females, with 48.5 years of mean age. 94 patients had bilateral fixation. The local Kyphotic angulation was pre-operatively 14.47+/-7.89 which was improved post-operatively to 6.56+/-4.31 with 25.2 ± 3.1 months mean follow-up duration.

In El Khateeb et al,[30] studies of 57 thoracolumbar junction fracture patients, Group A and B had 27 (18 males and 9 females), and 30 patients (21 males and 9 females), with similar age ranges respectively. Falls from height (39 cases) and road traffic accidents (12 cases) were the primary causes. Fractures were most common at L1 (35 cases), followed by L2 (12 cases) and D12 (10 cases). Preoperative Cobb angles were 22.51° and 19.37° in Group A and Group B respectively, improving to 14.17° in Group A and

11.77° in Group B postoperatively.

In a study conducted by Hassan et al,[31] there were 19 male patients, accounting for 53% of the total, and 17 female patients, making up 47%. The patients in the study had a mean age of 27 years and an SD of 8 years. The most common spinal segments affected were thoracolumbar (47%), lower thoracic (22%), and lumbar (19%). Significant score differences were found in ASIA, COBS ANGLE, and ESR measures (p-value < 0.05).

A study by Afridi et al,[32] concluded that the most frequent level was at the dorsolumbar junction (42.8%), and then the lumbar spine (23.8%). Pain was a universal symptom. Surgery was primarily indicated for neurological deficits (57%), spinal instability or deformity (16.6%), and post-chemotherapy cases (4.7%). Preoperative kyphotic angles averaged 43.06 ± 4.1 degrees, decreasing significantly to 9.45 ± 3.9 degrees postoperatively (p-value < 0.0001). In 83.3% of instances, the posterior approach was used, and at the three-month follow-up, 95.2% of those cases had improved neurology and 4.7% had shown no change.

In a study conducted by Yang et al.[33] A total of 27 participants, comprising 16 males and 11 females, with an average age of 48.4 ± 13.0 years, were enrolled in the study. The average duration of surgery was 320.6 ± 46.4 minutes, and the average estimated blood loss was 1470.6 ± 367.4 mL. From admission to the latest follow-up, the average Visual Analog Scale exhibited a significant decrease from 5.6 ± 1.3 to 0.5 ± 0.7. Moreover, the average ESR showed improvement from 69.4 ± 15.8 mm/h to within the normal range, and the average kyphotic angle was corrected from 66.6° ± 11.7° to 34.5° ± 6.6°. Patients with preoperative neurological deficits experienced a restoration of their neurological functions to normal levels. In drug susceptibility tests, 70.5% (11/17) of specimens demonstrated bacteria resistance to at least one first-line drug.

Another Study Conducted by Borzykh et al.[34] The research incorporated information extracted from the medical records of 69 individuals (47 females, 22 males) who underwent surgery for painful post-traumatic kyphosis affecting the T12, L1, and L2 vertebrae. These patients underwent sequential surgical procedures within a single surgical session. Following the surgical interventions, the post-traumatic kyphosis (LK) was successfully corrected to an average of 1.9°.

## CONCLUSION

Our study concluded that the outcome of transpedicular fixation of vertebral height was 18.93 ± 1.17 mm, Kyphotic angle was 9.68 ± 4.03° and Sagittal index was 5.83 ± 4.55 for the thoracic and lumbar tuberculous spine. This suggests that surgical correction of Thoracic and Lumbar Pott's disease carries good outcomes with acceptable post-operative correction.

## REFERENCES


1. Yin X, Yan L, Yang M, Liu S, He B. Bilateral costotransverse and local continuous chemotherapy approach for debridement, fixation, and fusion of contiguous multisegmental thoracic spinal tuberculosis: A retrospective study. Medicine (Baltimore). 2018;97(41):12752.
2. Mukhtar F, Butt ZA. Risk of adverse treatment outcomes among new pulmonary TB patients co-infected with diabetes in Pakistan: A prospective cohort study. PLoS One. 2018; 13(11):0207148.
3. Rajasekaran S, Soundararajan DCR, Shetty AP, Kanna RM. Spinal Tuberculosis: Current Concepts. Global Spine J. 2018;8(4 Suppl):S96-S108.
4. Holloway KL, Link K, Ruhli F, Henneberg M. Skeletal Lesions in Human Tuberculosis May Sometimes Heal: An Aid to Palaeopathological Diagnoses. PLoS One. 2013;8(4):62798.
5. Chen Y, Lu XH, Yang LL, Chen DY. Ossification of ligamentum flavum related to thoracic kyphosis after tuberculosis: case report and review of the literature. Spine. 2009;34:41-4.
6. Guven O. Severe kyphotic deformity in tuberculosis of the spine. Int Orthop. 1996;20:271.
7. Golsha R, Mehravar F, Alinezhad Esboie A, Rafiee S.

The Epidemiology of Skeletal Tuberculosis in Northeast of Iran: A Review of 229 Cases. Iran J Med Sci. 2018;43(4):380-85.
8. Oga M, Arizono T, Takasita M, Sugioka Y. Evaluation of the risk of instrumentation as a foreign body in spinal tuberculosis: clinical and biologic study. Spine. 1993;8:1890-4.
9. Rajasekran S, Soundarapandian S. Progression of kyphosis in tuberculosis of the spine treated by anterior arthrodesis. J Bone Joint Surg. 1989;71:1314-23.
10. Jain AK, Aggarwal PK, Arora A, Singh S. Behaviour of the kyphotic angle in spinal tuberculosis. Int Orthop. 2004;28:110-14.
11. Laheri VJ, Badhe NP, Dewnany GT. Single stage decompression, anterior interbody fusion and posterior instrumentation for tuberculous kyphosis of the dorso-lumbar spine. Spinal Cord. 2001;39:429-36.
12. Tadie M, Hemet J, Freger P. Morphological and functional anatomy of spinal cord veins. J Neuroradiol. 1985;12:3-20
13. Stroman PW, Nance PW, Ryner LN. Human cervical spinal cord.BMJ. 1999;42:571-6.
14. Rajasekaran S. Buckling collapse of the spine in childhood spinal tuberculosis. Clin Orthop. 2007;460:86-92.
15. Rajasekaran S. The natural history of post-tubercular kyphosis in children: radiological signs which predict late increase in deformity. J Bone Joint Surg. 2001;83-B:954-62.
16. Rajasekaran S, Shanmugasundaram TK. Prediction of the angle of gibbus deformity in tuberculosis of the spine. J Bone Joint Surg. 1987;69-A:503-9.
17. Upadhyay SS, Saji MJ, Sell P, Sell B, Hsu LC. Spinal deformity after childhood surgery for tuberculosis of the spine: a comparison of radical surgery and debridement. J Bone Joint Surg. 1994;76-B:91-8.
18. Jain AK, Dhammi IK, Prashad B, Sinha S, Mishra P. Simultaneous anterior decompression and posterior instrumentation of the tuberculous spine using an anterolateral extrapleural approach. J Bone Joint Surg. 2008;90-B:1477-81.
19. Rajasekaran S, Soundarapandian S. Progression of kyphosis in tuberculosis of the spine treated by anterior arthrodesis. J Bone Joint Surg. 1989;71-A:1314-23.
20. Upadhyay SS, Saji MJ, Sell P, Hsu LC, Yau AC. The effect of age on the change in deformity after anterior debridement surgery for tuberculosis of the spine. Spine. 1996;21:2356-62.
21. Abbas A, Rizvi SRH, Mahesri M, Salahuddin HRA. Conservative management of spinal tuberculosis: initial series from Pakistan. Asian Spine J. 2013;7(2):73-80.
22. Yoshizawa T, Nose T, Moore GJ. Functional magnetic resonance imaging of motor activation in the human cervical spinal cord. Neuroimage. 1996;4:174-82
23. Porszasz R, Beckmann N, Bruttel K. Signal changes in the spinal cord of the rat after injection of formalin into the hindpaw: characterization using functional magnetic resonance imaging. Proc Natl Acad Sci USA. 1997;94:5034-39.
24. Yin XH, Liu ZK, He BR, Hao DJ. Single posterior surgical management for lumbosacral tuberculosis: titanium mesh versus iliac bone graft: A retrospective case-control study. Medicine (Baltimore). 2017;96(51):9449.
25. Haq MI, Khan SA, Aurangzeb A, Ahmed E, Bhatti SN, Noman A. Radiological outcome of transpedicular screws fixation in the management of thoracolumbar spine injury. J Ayub Med Coll Abbottabad. 2015;27(1):171-3.
26. Helton LA, Defino Fabiano RTC. Low thoracic and lumbar burst fractures: radiographic and functional outcomes. Eu Spine J. 2007;16:1934–43.24.
27. Arif M, Inam M, Shabir M. Management of Thoracolumbar Spinal Fracture by Pedicular Screws and Rods. J Posgad Med Institute. 2009;7(2):109–13.25.
28. D'souza AR, Mohapatra B, Bansal ML, Das K. Role of Posterior Stabilization and Transpedicular Decompression in the Treatment of Thoracic and Thoracolumbar TB: A Retrospective Evaluation. Clin Spine Surg. 2017;30(10):E1426-E1433.
29. Luo ZW, Liao WJ, Sun BL, Wu JB, Zhang N, Zhang Y, Huang SH, Liu ZL, Zhang ZH, Liu JM. Short-segment fixation and transpedicular bone grafting for the treatment of thoracolumbar spine fracture. Frontiers in Surgery. 2023; 11;9:1039100.
30. El Khateeb EE, Tammam AG, Hamdan AR. Outcome of long-segment fixation versus inclusion of the fractured level in short-segment fixation for thoracolumbar junction fractures. Asian Journal of Neurosurgery. 2022;17(03):470-3.

31. Hassan S, Kalhoro A, Rehman L, Panezai AS, Javeed F. Transpedicular Fixation via Posterior Approach for Dorsal and Lumbar Spine Tuberculosis. Pakistan Journal Of Neurological Surgery. 2022;;26(1):39-45.
32. Afridi EA, Khan AA, Maqbool S, Shaheen N. Surgical Outcome of Spinal Tuberculosis Regarding Pain, Neurological Deficit, and Spinal Instability. Pakistan Journal Of Neurological Surgery. 2022;26(4):562-8.
33. Yang K, Feng C, Zheng B, Hui H, Kong L, Yan L, Hao D, He B. Single-Posterior Revision Surgery for Recurrent Thoracic/Thoracolumbar Spinal Tuberculosis With Kyphosis. Operative Neurosurgery. 2023;25(1):59-65.
34. Borzykh KO, Rerikh VV. Compensation mechanisms for post-traumatic thoracolumbar kyphosis. Хирургия позвоночника. 2023;20(2 (eng)):40-8.

## Additional Information

**Disclosures:** Authors report no conflict of interest.
**Ethical Review Board Approval:** The study was conformed to the ethical review board requirements.
**Human Subjects:** Consent was obtained by all patients/participants in this study.
**Conflicts of Interest:**
In compliance with the ICMJE uniform disclosure form, all authors declare the following:
**Financial Relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work.
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## AUTHOR CONTRIBUTION

| S. No. | Author's Full Name | Intellectual Contribution to Paper in Terms of: |
|---|---|---|
| 1. | Saad Sultan | Study methodology & design. |
| 2. | Saad Sultan & Ibrahim | Research writing, collection of data & calculation. |
| 3. | Amer Zaman | collection of data & calculation. |
| 4. | Junaid Alam | Analyzed the data & interpretation of results. |
| 5. | Ibrahim | Literature review & quality insurer. |
| 6. | Fizza Gul | Referencing & Editing. |