

Clinico-Radiological Outcomes of Posterior Decompression with Instrumentation in Patients with Pott's Spine Presenting with Neurological Deficits: A Prospective Observational Study

Shivam Bisen¹, Afroz A Khan¹, Abhinav Srivastava¹, Vipin Kumar¹, Mahesh K Soni¹, Noorin Zaidi²

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ABSTRACT

Background: Pott's spine complications due to neurologic disorders require urgent surgery for preventing long-term paralysis. While there is growing acceptance of post-operative surgery for treating this disease, there is still a lack of comprehensive clinical, and radiology results available to us in these countries. The paper is about evaluating results from surgeries performed on peoples who have been operated, due to nerve problems in their back called pott's disease through an approach known as posterior decompression and instrumentation procedure.

Methods: This is an observational study conducted here after at a tertiary care center of Lucknow for 18-months. There are 33 cases of adults over 12-years-old with Pott's spine and clear surgical indications like neurological deficits, failed medical therapy, spinal instability, or deformity who underwent single-stage posterior decompression, debridement, and pedicle screw instrumentation. The clinical recovery of patients was measured by means of a visual analog scale to assess their level of pain and an American Spinal Injury Association Impairment Scale. The radiological union was evaluated by Lee's criterion at baseline and after 6-weeks, 3-months, 6-months and 12-months following surgery. Histopathological analysis and RT-PCR confirmed intraoperative tissue sample results.

Results: Mean patient age was 39.45 ± 14.73 years (66.7% females). Mean symptom duration was 53.45 ± 24.67 months. Baseline mean VAS score (5.00 ± 1.41) reduced significantly all follow-ups, reaching 0.00 ± 0.00 at 12-months (100% pain resolution, $p < 0.001$). Preoperatively, 63.6% had ASIA grade D, 30.3% grade C, and 6.2% grade A. At 12-months, 96.9% achieved ASIA grade E (normal), with significant improvement from baseline ($p < 0.001$). Radiological fusion: probable/definite fusion increased from 0% at baseline to 66.7% at 6-months and 87.9% at 12-months ($p < 0.001$). RT-PCR confirmed diagnosis in 90.9%, histopathology in 81.8%.

Conclusion: Posterior decompression with instrumentation provides excellent and sustained clinico-radiological outcomes in Pott's spine patients with neurological deficits, with significant pain relief, near-complete neurological recovery, and satisfactory fusion rates by 12-months.

KEYWORDS: Pott's spine, spinal tuberculosis, neurological deficit, posterior decompression, clinico-radiological outcome.

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INTRODUCTION

The tuberculosis problem remains an important issue for world health today particularly in developing countries. The country has the highest number of cases of tuberculosis (TB), with about 35-40 crores people infected and around 26 lakhs progressing to active disease annually.¹ Worldwide there are approximately 10.7 million new cases of tuberculosis for 2024 resulting in around 1.23 million deaths.²

While mainly known for being an intrapleural disease, extrapulmonary diseases also occur and account for about 20-25% of all TB cases.^{3,4} Musculoskeletal involvement is an important part of these cases, and among skeletal manifestations, spinal involvement (Pott's spine) accounts for more than half of all instances.⁵⁻⁷ The Pott's spine is due to hematogenous spread of Mycobacterium tuberculosis into vertebrae leading to bone destruction, structural

¹Department of Orthopaedics, Era's Lucknow Medical College and Hospital, ERA University, Lucknow, UP, India

²Department of Pathology, Era's Lucknow Medical College and Hospital, ERA University, Lucknow, UP, India

Corresponding Author: Shivam Bisen

Email: shivambisen98@gmail.com

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deformities, and paravertebral abscesses which have a high risk of vertebral collapse and neurological compromise, if left untreated.^{8,9}

Recognition of prompts and prompt management is important for preventing chronic problems such as scoliosis, kyphosis, and paraplegia.^{8,10} Although, long-term anti-tubercular therapy lasts for 9 to 12 months, surgery may be

needed when there are cases like progressive neurological deficits, severe kyphotic deformity, spinal instability, large abscesses, or no response to conservative measures.¹⁰⁻¹²

Traditionally, the anterior approach was considered the gold standard because spinal tuberculosis primarily affects the anterior vertebral column.¹³ However, posterior-only approaches have gained increasing acceptance due to advances in spinal instrumentation. Posterior surgery allows adequate debridement, decompression, and strong stabilization using pedicle screw-rod constructs through a single incision, with reduced surgical morbidity.⁴⁻¹⁸ Nevertheless, comprehensive clinico-radiological evaluation of surgical outcomes, particularly in patients presenting with neurological deficits, has been infrequently reported, undermining clinical decision-making. Hence, this study was carried out to evaluate the clinico-radiological outcome of patients surgically treated for Pott's spine presenting with neurological deficits.

Primary Objective: To assess the preoperative and postoperative clinico-radiological profile of patients with Pott's spine treated with posterior decompression with instrumentation, with follow-up at 6-weeks, 3, 6, and 12-months.

Secondary Objective: To confirm the clinically diagnosed cases of Pott's spine by RT-PCR or histopathology.

MATERIAL AND METHODS

Study Design and Setting: The prospective observational study was conducted for 18 months at Era's Lucknow Medical College and Hospital, Lucknow, India. This project is an interdisciplinary study that involves all three departments- orthopaedic surgery, radiology, pathology, and physical medicine/rehabilitation carried out according to the STROBE guidelines for observational studies.

Study Population: Clinically and radiologically diagnosed cases of Pott's spine attending the outpatient or inpatient department.

Inclusion and Exclusion Criteria: Inclusion criteria: all patients with Pott's spine having indications for surgery (neurological deficit, failed medical therapy, significant instability, or prominent deformity), both sexes aged above 12-years. Exclusion criteria: previous spine surgery, significant trauma, or spinal metastasis.

Sample Size Calculation: Sample size was calculated using the formula based on variation in VAS score from a prior study,¹⁹ assuming a clinically significant difference with 90% power and 5% type I error. A sample size estimate required 32 participants for this study. For accounting purposes due to possible dropout rates or loss to follow up, 35 patients were initially enrolled; out of these, 33 completed the full 12-month follow-up and were included in the final analysis.

Ethical Approval and Consent: Approval was granted by the Institutional Ethical Committee, and written informed

consent was secured from every participant prior to enrollment.

METHODOLOGY

The diagnosis is made by means of medical records, physical exam, x-ray, MRI scan and CT-guided biopsies. Baseline information such as age, gender, profession, symptoms' features, length of time spent ill beforehand and previous treatments were collected by means systematic recording method.

The pain level was measured by a Wong-Baker Faces Pain Rating Scale of 0-10²⁰ whereas neurological status is rated according to ASIA Impairment Scale.²¹ Patients were given an antibiotic before surgery for tuberculosis. Under general anesthesia by means of an anterior-posterior midline incision for pedicle screw fixation near/away from lesions; laminectomy and transforaminal debridements followed by autografts on bones.

Histopathology and RT-PCR were used for verifying tissue specimens taken during surgery. After surgery, post-operative anti-tubercular treatment was given along with scheduled follow-up visits including VAS score evaluation, ASIA grade assessment and radiographic imaging for fusion according to Lee's criteria,²² at 6 weeks, 3 months, 6 months and 12 months.

STATISTICAL ANALYSIS

MS-Excel was used for data management while IBM SPSS Statistics (version 25.0) was used to conduct statistical analysis on it. Categorical data is reported by frequency and percentage while quantitative data can be represented by mean, standard deviation, median or interquartile range (IQR) depending upon need. Pain score changes are analyzed by means of a paired t-test while shifts to ASIA grade levels and fusions are assessed through an unpaired sign rank analysis. The *p-value* is less than 0.05 to be statistically significant.

RESULTS

Baseline Demographic and Clinical Profile (Tables 1-2)

There are 33 patients involved for this study. The participant ages ranged from 17-67 years old with an average of 39.45 ± 14.73 years; most patients were between 21-50 years old (69.7%). Females comprised 66.7% (M:F = 0.5:1). Housewives (48.5%) and farmers (27.3%) were the predominant occupations. Mean symptom duration was 53.45 ± 24.67 months; 39.4% had symptoms >60 months. Stiffness (90.9%) was the most common complaint, followed by back pain (78.8%), limited mobility (78.8%), and kyphosis (78.8%). History of medical TB treatment was present in 78.9%, and family history of TB in 84.8%.

Clinico-Radiological Outcomes (Tables 3-4)

Pain (VAS): Mean VAS scores decreased significantly from baseline (5.00 ± 1.41) to 0.00 ± 0.00 at 12-months (100%

Table 1: Age Distribution of Study Population (n=33).

Age Group	No. of cases	Percentage
≤20 Years	3	9.1
21-30 Years	9	27.3
31-40 Years	6	18.2
41-50 Years	8	24.2
51-60 Years	4	12.1
>60 Years	3	9.1
Mean ± SD (Range)	39.45 ± 14.73 (17-67)	

Table 2: Distribution According to Gender and Presenting Complaints.

Parameter	Category	No. of cases	Percentage
Gender	Male	11	33.3
	Female	22	66.7
Presenting Complaints	Stiffness	30	90.9
	Back pain	26	78.8
	Limited mobility	26	78.8
	Kyphosis	26	78.8
	Paralysis	25	75.8
	Weakness	23	69.7
	Weight loss	23	69.7
	Fever	21	63.6

reduction; $p < 0.001$ at all intervals) (Table 3).

Neurological Status (ASIA): At baseline, 63.6% had grade D, 30.3% grade C, 6.2% grade A. By 12-months, 96.9% achieved grade E (normal). Improvement was significant at all intervals ($p < 0.001$) (Table 3).

Radiological Fusion (Lee's Criteria): Definite pseudoarthrosis was present in 100% at baseline, 6-weeks, and 3-months. At 6-months, probable/definite fusion was seen in 66.7%; at 12-months, 87.9% achieved probable/definite fusion ($p < 0.001$) (Table 4).

Diagnostic Confirmation: Diagnosis was confirmed in all 33 patients. RT-PCR was positive in 90.9% (30/33), histopathology in 81.8% (27/33). The difference was not statistically significant ($p = 0.225$). Concurrent positivity was seen in 72.7%.

DISCUSSION

The current research was a prospective study that evaluated the clinical and radiological results for posterior decompression and instrumentation on 33 patients with Pott's disease and related neurological disorders. Key findings complete pain relief (100% resolution), significant neurological recovery, with 96.9% of patients achieving ASIA grade E, and high rates of satisfactory bone fusion, 87.9% showing probable or definite fusion at 12-months, indicate that a single stage posterior procedure is very

effective on this complicated population.

Mean participants aged 39.45 years with a female predominance of 66.7% contrasts to other research which found either male domination²³⁻³⁰ or equal sex ratio³¹. The higher percentage of females being diagnosed may reflect regional patterns to health care use since they are often seen when their neurologic problems significantly impair activities of living day-to-day life. Similarly, the extended mean symptom duration of 53.45 months observed here, compared to 3.4 to 21.6 months in other literature,^{23,32} reflects our focus on patients with neurological deficits which may indicate delayed initial presentation.

In conclusion, there is an excellent correlation between this reduction of VAS pain score from a baseline mean of 5.00 down to 0.00 at 12-months and results obtained through previous research on post-operative procedures. Wang *et al.* (2023) reported >90% reduction,³³ and Krishnamurthy *et al.* (2024) reported reduction from 6 to 0.6.³⁴ Complete pain resolution in our study may be attributed to the younger age profile and less physically demanding occupations (housewives, shopkeepers) of the majority.

Neurological recovery was excellent: 96.9% achieved ASIA at 12-months. This is superior to Pooswamy and Muralidharaogpalan (73.9% achieving grade E).³⁵ and Charde *et al.* (37.5%).¹⁹ The better outcome may be due to a younger mean age (39.45 vs. 48.86 years) and a higher proportion of less severe initial deficits (63.6% grade D vs. 60.9% grade C/D in other studies). Our findings support that even delayed surgical decompression can yield excellent neurological outcomes, consistent with Rathod *et al.*³⁶

The overall fusion rate of 87.9% (probable and definite fusion) at 12-months is better than that reported by Prakashappa *et al.* The slightly lower rate of definite bone fusion specifically (60.6%) compared with studies having an extended follow-up period such as Yi *et al.*, who reported 100% fusion over a mean follow-up of 40.6 months.¹⁴ indicates that spinal fusion continues to mature beyond the one-year mark, and that longer-term observation would likely reveal higher rates.

Limitations: There are several limitations that need to be considered such as low numbers of participants, single center study design, short follow up period of 12-months, lack of comparison with other treatments like anterior or conservative ones and possible recall bias about how long symptoms lasted. There is a need for larger-scale multi-center trials with longer-term follow-ups to confirm this finding.

CONCLUSION

Combining posterior decompression with pedicle screws is an excellent treatment option for people who have suffered from Pott's disease and nerve problems. It provides significant and long-lasting pain relief (100% resolution within 12-months), good neurological recovery rate of 96.9%, and satisfactory radiological fusion probability/definiteness

Table 3: VAS and ASIA Scores at Baseline and Follow-up.

Time interval	Mean VAS $\pm$ SD	% Change in VAS	ASIA Grade E (%)	<i>p-value</i> *
Baseline	5.00 $\pm$ 1.41	--	0 (0%)	--
6 weeks	2.64 $\pm$ 0.74	-47.2%	18 (54.5%)	<0.001
3 months	1.09 $\pm$ 0.58	-68.2%	30 (90.9%)	<0.001
6 months	0.30 $\pm$ 0.53	-94.0%	32 (96.9%)	<0.001
12 months	0.00 $\pm$ 0.00	-100%	32 (96.9%)	<0.001
* <i>p-value</i> for change from baseline (VAS: paired t-test; ASIA: Wilcoxon signed-rank test)				

Table 4: Radiological Fusion Status at Follow-up (Lee's Criteria).

Time	Definite Pseudoarthrosis	Possible Pseudoarthrosis	Probable Fusion	Definite Fusion	<i>p-value</i> *
Baseline	33 (100%)	0	0	0	--
6-months	0	11 (33.3%)	20 (60.6%)	2 (6.1%)	<0.001
12-months	0	4 (12.1%)	9 (27.3%)	20 (60.6%)	<0.001
*Wilcoxon signed-rank test for change from baseline					

Table 5: Comparison of VAS Outcomes with Other Studies.

Study (Year)	Approach	Baseline VAS	Follow-up VAS	% Reduction
Wang <i>et al.</i> 2023 [33]	Posterior	6.00	0.21	96.5%
Krishnamurthy <i>et al.</i> 2024 [34]	Posterior	6.0	0.6	90.0%
Charde <i>et al.</i> 2021 [19]	Posterior	7.25	1.28	82.3%
Present Study	Posterior	5.00	0.00	100%

Table 6: Comparison of Fusion Rates with Other Studies.

Study (Year)	Approach	Fusion Rate	Follow-up
Prakashappa <i>et al.</i> 2021 [37]	Posterior	85% solid fusion	12 months
Yi <i>et al.</i> 2021 [14]	Posterior	100% bony fusion	40.6 months
Panthi <i>et al.</i> 2025 [38]	Posterior	96.43% Grade I/II fusion	12 months
Joshi <i>et al.</i> 2026 [32]	Posterior (53.6%)	82.1% Grade 1 fusion	16-18 months
Present Study	Posterior	87.9% probable/definite	12 months

of 87.9%. Single stage post operative technique offers benefits such as direct neural decompression, deformity correction and stability at a reasonable level of morbidity. In general terms, early detection and prompt surgery can be effective at restoring spinal stability and neurological function to many people living with TB, where it is not detected until later stages due to late onset symptoms.

REFERENCES

- National TB Elimination Programme. Guidelines for Programmatic Management of Tuberculosis Preventive Treatment in India. July 2021.
- World Health Organization. Global tuberculosis report 2025. Geneva: WHO; 2025.
- VidyaRaj CK, Vadakunnel MJ, Mani BR, et al. Prevalence of extrapulmonary tuberculosis and factors influencing successful treatment outcomes among notified cases in South India. *Sci Rep.* 2025;15:8290.
- Kolaparthi R, Rama Krishna C, Pranavi V. Trends and distribution of extrapulmonary tuberculosis: a 5-year retrospective study. *Int J Med Pharm Res.* 2025;6(5):1791-1797.
- Yu Y, Xiang Y, Liu H, et al. Analysis of epidemiological characteristics of extrapulmonary tuberculosis from South-Central China. *Front Public Health.* 2024;12:1405358.
- Rolo M, González-Blanco B, Reyes CA, et al. Epidemiology and factors associated with extra-pulmonary tuberculosis in a low-prevalence area. *J Clin Tuberc Other Mycobact Dis.* 2023;32:100377.
- Leowattana W, Leowattana P, Leowattana T. Tuberculosis of the spine. *World J Orthop.* 2023;14(5):275-293.
- Cahyadi NIT, Suyasa IK. Tuberculous spondylitis: a comprehensive review of epidemiology, diagnosis, and management. *Asian J Orthop Res.* 2025;8(2):189-201.
- De la Garza Ramos R, Goodwin CR, Abu-Bonsrah N, et al. The epidemiology of spinal tuberculosis in the United States: an analysis of 2002-2011 data. *J Neurosurg Spine.* 2017;26(4):507-512.
- Garg RK, Somvanshi DS. Spinal tuberculosis: A review. *J Spinal Cord Med.* 2011;34(5):440-454.
- Rajasekaran S, Khandelwal G. Drug therapy in spinal tuberculosis. *Eur Spine J.* 2013;22 Suppl 4:587-93.

12. Moon MS. Tuberculosis of spine: current views in diagnosis and management. *Asian Spine J.* 2014;8(1):97-111.
13. Fisahn C, Alonso F, Hasan GA, et al. Trends in Spinal Surgery for Pott's Disease (2000-2016): An Overview and Bibliometric Study. *Global Spine J.* 2017;7(8):821-828.
14. Yi Z, Song Q, Zhou J, Zhou Y. The efficacy of single posterior debridement, bone grafting and instrumentation for the treatment of thoracic spinal tuberculosis. *Sci Rep.* 2021;11(1):3591.
15. Gao Q, Han C, Romani MD, et al. Posterior-only debridement, internal fixation, and interbody fusion using titanium mesh in the surgical treatment of thoracolumbar tuberculosis with spinal epidural abscess: a minimum 5-year follow-up. *BMC Musculoskelet Disord.* 2021;22(1):917.
16. Zeng Y, Chen Z, Qi Q, et al. Clinical and radiographic evaluation of posterior surgical correction for the treatment of moderate to severe post-tuberculosis kyphosis. *J Neurosurg Spine.* 2012;16(4):351-8.
17. Luo C, Wang X, Wu P, et al. Single-stage transpedicular decompression, debridement, posterior instrumentation, and fusion for thoracic tuberculosis with kyphosis and spinal cord compression in aged individuals. *Spine J.* 2016;16(2):154-62.
18. Gan J, Zhang C, Tang D, Du X. Surgical treatment of spinal tuberculosis: an updated review. *Eur J Med Res.* 2024;29:588.
19. Charde P, Samal N, Gudhe M, Khan S. Postoperative clinico-radiological outcome of pott's spine. *Annals of African Medicine.* 2021;20(3):164-168.
20. Wong D, Hockenberry-Eaton M, Wilson D, et al. *Wong's essentials of pediatric nursing.* 2001, Elsevier. St.Louis.
21. Kirshblum SC, Burns SP, Biering-Sørensen F, et al. International standards for neurological classification of spinal cord injury (revised 2011). *J Spinal Cord Med.* 2011;34(6):535-546.
22. Lee CK, Vessa P, Lee JK. Chronic disabling low back pain syndrome caused by internal disc derangements: The results of disc excision and posterior lumbar interbody fusion. *Spine.* 1995;20(3):356-361.
23. Tang Y, Wu WJ, Yang S, et al. Surgical treatment of thoracolumbar spinal tuberculosis-a multicentre, retrospective, case-control study. *J Orthop Surg Res.* 2019;14(1):233.
24. Zhao C, Luo L, Liu L, et al. Surgical management of consecutive multisegment thoracic and lumbar tuberculosis: anterior-only approach vs. posterior-only approach. *J Orthop Surg Res.* 2020;15(1):343.
25. Prakashappa TH, Mohan NS, Shyamsundar Y. A prospective study of functional outcome in thoracolumbar Pott's spine with posterior only approach. *Int J Orthop Sci.* 2021;7(2):666-669.
26. Gao Q, Han C, Romani MD, et al. Posterior-only debridement, internal fixation, and interbody fusion using titanium mesh in the surgical treatment of thoracolumbar tuberculosis with spinal epidural abscess: a minimum 5-year follow-up. *BMC Musculoskelet Disord.* 2021;22(1):917.
27. Debnath UK, McConnell JR, Kumar S. Single-Stage Combined Anterior Corpectomy and Posterior Instrumented Fusion in Tuberculous Spondylitis With Varying Degrees of Neurological Deficit. *Int J Spine Surg.* 2021;15(3):600-611.
28. Qi L, Zhao Y, Xu B, Li C, Wang Y. Two-stage treatment for severe spinal kyphotic deformity secondary to tuberculosis: halo-pelvic traction followed by a posterior-only approach correction. *BMC Musculoskelet Disord.* 2022;23(1):991.
29. Hang L, Haibier A, Kayierhan A, Liu Y, Abudurexiti T. A Comparative Study of Anterior and Posterior Tuberculosis Lesions for the Treatment of Thoracolumbar Tuberculosis disease: A Single Institution Experience. *Infect Drug Resist.* 2024;17:5375-5386.
30. Krishnamurthy T, Adithya M, Amith D. Posterior approach debridement decompression and stabilization with pedicle screw fixation for thoraco-lumbar spinal tuberculosis. *Eur J Cardiovasc Med.* 2024;14(2):644-649.
31. Musali SR, Gollapudi PR, Manne S, et al. Outcome Analysis of Posterolateral Decompression and Spinal Stabilization for Tuberculous Spine. *Asian J Neurosurg.* 2019;14(2):479-482.
32. Joshi J, Srikant B, Balasubramaniam S, Nadkarni T. Determinants of surgical outcome in spinal tuberculosis: A retrospective analysis of 84 patients. *J Craniovertebr Junction Spine.* 2026;17(1):63-70.
33. Wang T, Ma Z, Lei W, et al. Clinical efficacy of different open approaches in the surgical treatment of thoracolumbar tuberculosis: a single-center retrospective comparative study. *J Orthop Surg Res.* 2023;18(1):352.
34. Krishnamurthy T, Adithya M, Amith D. Posterior approach debridement decompression and stabilization with pedicle screw fixation for thoraco-lumbar spinal tuberculosis. *Eur J Cardiovasc Med.* 2024;14(2):644-649.
35. Pooswamy SS, Muralidharaogopalan NR. Thoracolumbar spinal tuberculosis---assessment of functional outcome following posterior decompression and posterior instrumentation. *Int J Res Orthop.* 2019;5:109-114.
36. Rathod TN, Sathe AH, Marathe NA. It's Never Too Late: Neurological Outcome of Delayed Decompression in Tuberculosis of Spine. *Global Spine J.* 2021;11(5):716-721.
37. Prakashappa TH, Mohan NS, Shyamsundar Y. A prospective study of functional outcome in thoracolumbar Pott's spine with posterior only approach. *Int J Orthop Sci.* 2021;7(2):666-669.
38. Panthi DK, Jain V, Parihar YS, Dubey D, Tandon S. Posterior Decompression and Stabilization in Thoracic and Lumbar Spinal Tuberculosis: A Prospective Observational Study. *J Orthop Case Reports.* 2025;15(11):405-413.

Orcid ID:Shivam Bisen - <https://orcid.org/0000-0003-3936-1620>Afroz A Khan - <https://orcid.org/0000-0003-0876-6521>Abhinav Srivastava - <https://orcid.org/0000-0003-4410-6376>Vipin Kumar - <https://orcid.org/0000-0003-3017-6253>Mahesh K Soni - <https://orcid.org/0000-0002-4213-9006>Noorin Zaidi - <https://orcid.org/0000-0003-3182-4777>