

**ORIGINAL RESEARCH**

# RESULTS OF TRANSPEDICULAR DECOMPRESSION AND POSTERIOR INSTRUMENTATION FOR THORACIC TUBERCULOSIS

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**ABSTRACT**

**Introduction:** Tuberculous spondylitis is the most common form of extrapulmonary tuberculosis. Predominantly, those affected by TBS are from underprivileged socio-economic groups, frequently incapable of affording costly therapies and taking prolonged leaves from work owing to economic hardships.

The aim of this research is to assess the functional and radiological outcomes of single-stage transpedicular decompression, debridement, posterior instrumentation, and fusion in managing thoracic tuberculosis.

**Methods:** This investigation is a combined prospective and retrospective clinical study was done with 15 cases at Orthopaedics Department at the Kamineni Institute of Medical Sciences, Narketpally, Telangana between October 2017 and September 2019.

**Results:** The study included 15 patients, with an average age of 45.8 years. Six had two vertebrae involved in their condition, seven had three, and two had four. All patients had neurological symptoms before surgery, and after 18 months of anti-tuberculous therapy, patients showed substantial improvements in their neurological grading. The average time patients had neurological symptoms before surgery was 9.7 weeks, and they received anti-tuberculous therapy for an average of 2.1 weeks before surgery. At final follow-up, the majority of patients had either excellent or good functional outcomes.

**Conclusion:** In conclusion, our study shows that spinal instrumentation is safe and crucial for spine stabilization in active tuberculosis cases. Despite its demanding nature, single-stage decompression with fusion and kyphosis correction can prevent neurological complications and expedite healing.

**Key words:** Tuberculous spondylitis; transpedicular screws; ATT; frankel's grade

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**Introduction**

Tuberculous spondylitis (TBS) represents the most prevalent type of tuberculosis that affects parts of the body outside the lungs. The majority of individuals afflicted with TBS come from lower socio-economic backgrounds, often unable to finance expensive treatments and unable to take extended time off work due to financial constraints <sup>1</sup>. In recent times, the occurrence of TBS in developed nations has seen an uptick due to factors such as international travel, immunosuppressive diseases like HIV, and the emergence of multi-drug resistant bacterial strains.

TBS presents itself in various forms, but it most commonly affects the anterior column of a single motion segment, specifically two adjacent vertebral bodies and the disc that separates them (peri-discal). In some cases, TBS can impact more than a single motion segment, resulting in what is termed as multilevel TBS, involving three or more vertebrae, either in direct sequence or not. A small percentage of cases, between 2 and 10%, see TBS affecting only the posterior column (vertebral arch) or an individual vertebral body (central) <sup>2</sup>.

The advent of diagnostic tools such as magnetic resonance imaging (MRI), computed tomography (CT) guided biopsy and polymerase chain reaction (PCR) allows spinal tuberculosis to be diagnosed accurately. The primary goals of spinal TB treatment are to eliminate the disease, prevent neurological damage, correct deformities, promote early mobility, and reintegrate the patient into daily life. Anti-tuberculous (ATT) chemotherapy is the primary treatment method, but early diagnosis can be difficult<sup>3</sup>. Relying solely on chemotherapy or prolonged bed rest may not prevent paraplegia or spinal instability. Commonly, patients can develop kyphotic deformity, leading to pain, respiratory distress, and potential spinal cord compression. Surgical intervention is critical for preventing symptom progression and maintaining spinal stability, which is essential for normal functionality and reducing pain and neurological deficits. Therefore, despite the prevalence of chemotherapy, surgery remains crucial in managing severe cases<sup>4</sup>.

Surgery is indicated for spinal cord compression causing neurological issues, severe deformity causing imbalance, clinical instability, and inaccessible necrotic bone, large abscesses resistant to ATT, and unclear diagnosis or inadequate response to ATT. The best surgical approach and instrumentation modality of spinal TB remains controversy. Current surgical approaches mainly advocated by the surgeons are anterior approach alone, posterior approach alone and combined approach<sup>5</sup>.

Posterior instrumentation has become popular as a technique to correct angular deformities and stabilise an unstable spine. Several authors have reported that the use of the posterior approach combined with debridement and instrumentation to treat spinal tuberculosis has led to favourable clinical outcomes<sup>6</sup>. The purpose of this study is to evaluate the functional and radiological outcome of single stage transpedicular decompression, debridement posterior instrumentation and fusion in the treatment of the thoracic tuberculosis.

### Methodology

This study is a prospective and retrospective clinical study of results of transpedicular decompression and posterior instrumentation for thoracic tuberculosis. Total of 15 cases were evaluated and assisted during the period from October 2017 to September 2019. The

study was conducted in the department of Orthopedics, Kamineni Institute of Medical Sciences, Narketpally, Telangana.

All the above patients underwent treatment, as per a specific treatment plan. All the patients were initially assessed in the out-patient department or casualty according to their presentation and then they underwent a detailed evaluation of their hemodynamics, spine, neurological status and other injuries if associated with trauma. The patients were interviewed; their epidemiological, historical, subjective and physical findings were noted. A neurological chart was maintained for each patient. All the patients had routine X-rays of thoracolumbar and lumbar spine in both anteroposterior and lateral views. In all the patients MRI was done for affordable patients. The indication for the surgery was instability for which instrumentation was needed to restore spinal stability or to protect neurological elements.

### Inclusion criteria

1. Patients with Spondylodiscitis.
2. Matured skeleton [age >20 years]
3. All patients with associated neurological deficits
4. All patients presenting with spinal deformity.

### Exclusion criteria

1. Immature skeleton [age < 20 year].
2. Patients not fit for General Anaesthesia.
3. Malignancy, secondary's in spine.
4. Congenital deformity of spine.

### Procedure

Under general anaesthesia, patients were operated in a prone position. A posterior midline approach was used to insert transpedicular screws into vertebrae. Temporary stabilization was done to prevent spinal cord injury during decompression and focal debridement. Diseased vertebral bodies were exposed and abscesses drained. After corpectomy and debridement, the deformity was corrected using permanent rods. Posterior inter body grafts were applied and spinal fusion was done using bone graft from the iliac crest. The surgery wound was closed over a suction drain, which remained for 48 hours post-surgery. Biopsy specimens were sent for analysis

### Results

**Table 1: Age and sex distribution among the patients in the study (n = 15)**

Age (in years)	Male	Female
21-30	3	1
31-40	2	0
41-50	1	1
51-60	1	2
61-70	3	1
Total	10	5

The study included 15 patients with 5 female and 10 male patients with an average age of 45.8 years (range 21 – 70 years).

**Table 2: Total number of vertebra involved in each patient (n = 15)**

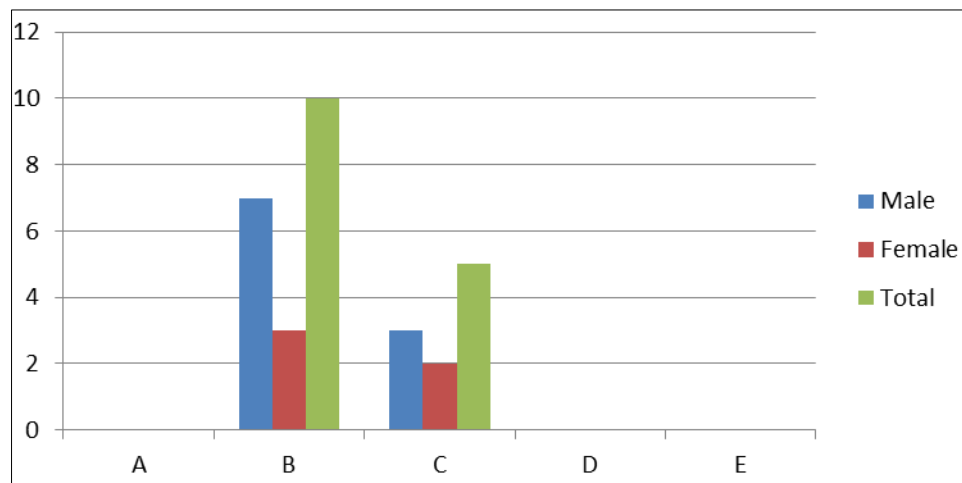
Number of vertebra involved	Total	Percentage
2	6	40%
3	7	46.6%
4	2	13.3%

6 patients had two vertebral involvement, while 7 patients had three vertebral involved and 2 patients had four vertebra involved (Table 2).

**Table 3: Number of patients with and without cold abscess at presentation (n = 15)**

	Total	percentage
Patients with cold abscess	11	73.3%
Patients without cold abscess	4	26.6%

Total of 11 patients presented with cold abscess and 4 patients didn't have any signs of cold abscess



**Fig 1: Preoperative neurological status (Frankel grading) (n = 15)**

All patients had neurological involvement before surgery (Frankel's Grade) B in 10 patients, Grade C in 5 patients).

**Table 4: post-operative neurological status in preoperative grade B patients after surgery (n = 10)**

Preoperative grade B patients	Postoperative status after 2 months of follow-up	Postoperative status after 18 months of follow-up
1	C	D
2	E	E
3	C	D
4	E	E
5	C	D
6	E	E
7	D	D
8	E	E
9	D	D
10	E	E

All the 10 cases in Frankel's grade B at the time of presentation; showed steady improved to grades C, D, E in the follow up period. At the end of 18 months, 50% of the cases progressed to grade E and the rest to grade D. All the patients were given ATT for a period of 18 months.

**Table 5: post-operative neurological status in preoperative grade C patients after surgery (n = 5)**

Preoperative grade C patients	Postoperative status after 2 months of follow up	Postoperative status after 18 months of follow up
1	C	D
2	D	E
3	D	E
4	E	E
5	E	E

All the 5 cases in frankel's grade C at the time of presentation; later they improved to grades C, D, E in the follow up period. At the end of 18 months, 80% of the cases progressed to grade E and the rest to grade D (Table 5).

The average duration of neurological involvement before surgery was 9.7 weeks (range 1- 20 weeks) and duration of ATT was 2.1 weeks (range 1-8 weeks) prior to surgery (Data not shown).

**Table 6: Overall neurological status preoperatively and postoperatively**

Grade	Preoperative	2 months follow-up	Final follow-up (18 months)
A	0	0	0
B	10	0	0
C	5	4	0
D	0	4	6
E	0	7	9

At the end of first follow up (after 2 months) 7 patients improved to Grade E, while 4 patients improved to Grade D, 3 patients improved to Grade C, 1 patient persisted to have Grade C involvement. At the latest follow up [average follow up duration is 18 months (range 1-41 months) (Table 6)

Out of 10 patients in grade B, 5 patients improved to Grade E and 5 patients improved to grade D. Out of 5 patients in grade C, 4 patients improved to Grade E and 1 patients improved to grade D. ESR was also assessed in the present study, mean ESR value were 48.3mm/h preoperatively and 70.6mm/h postoperatively (immediate) and returned to normal at the last follow-up. Most of the patients had kyphotic deformity and backache. The mean preoperative kyphosis in thoracic spine before surgery was 23.4

degrees (range 15 - 45 degrees) and average kyphosis postoperatively was 10.3 degrees (range 6 - 20 degrees) with a correction of 56%. Average kyphosis at the end of 18 months was 14.6 degrees (range 6-25 degrees) with a final correction of 37.7%. Average time taken for consolidation of bone graft is 35.6 weeks (range 16-48 weeks) (data not shown).

#### Duration of immobilization

Patients were mobilized with Taylor's brace postoperatively for 3 months.

#### Follow up duration

The average follow up duration was 18 months (range 1-41 months)

**Table 7: Functional outcome of surgery after 18 months of follow-up (final follow-up)**

Grade	Functional outcome	Percentage
Excellent	9	60%
Good	6	40%
Fair	0	0
Poor	0	0

At final follow-up 9 patients presented with excellent functional outcome, that is no back pain, no limitation of activities and 6 patients presented with good functional outcome that is back pain relieved with little medication with minimal restriction of activities (Table 7).

#### Discussion

Spinal tuberculosis prevails in many parts of the world and is a serious orthopedic problem, usually presenting with neurological deficit, paraplegia and

kyphosis, if left untreated or inadequately treated. The definitive diagnosis and management of Tuberculosis of the spine has always been difficult and a topic of controversy.

The present study showed an average age of 45.8 years with sex distribution was Male: Female as 10:5. Our observations were in accordance with earlier studies<sup>7-9</sup>. In the present study, the number of vertebrae involved in 6 patients was two, 7 patients were three, and 2 patients were four. Similar observations were also made by several authors<sup>10</sup>.

In the present study, 11 patients presented with cold abscess and 4 without cold abscess preoperatively. Similar observations were also seen in a study conducted by Laheri and coworkers<sup>11</sup>, 20 patients presented with cold abscess and 8 without cold abscess preoperatively.

In the present study, the preoperative neurological status according to Frankel's grading 10 patient had grade B, 5 patients had grade C these observations were in accordance with other studies<sup>8, 9</sup>. In this study, debridement, simple internal fixation, and interbody thoracic fusion via one-stage posterior approach only, with debridement, interbody bone graft was performed in one operation, with decompression under direct vision, without causing injury to the spinal cord all of which demonstrates its major clinical value. The fact that the thoracic spinal canal volume is small makes this region more susceptible to spinal cord injury<sup>12</sup>.

The prevalent infringement of anterior and middle column in spinal TB often complicates posterior operations. The outlined method provides adequate surgical space via resection of facet joint sides, diapophysis, costosternal/costovertebral joints, and small rib portions. This enables direct dura mater visualisation for comprehensive focal TB removal without spinal cord damage. Spinal stability of all patients was unaffected by this approach, and all patients attained bony fusion. ESR and CRP values recovered within three months of surgery<sup>13</sup>.

Results obtained from this present study showed that no patients had TB meningitis, which is consistent with the other reports<sup>14</sup>. Additionally, complete focal cleaning expanded the scope of operation and allowed removal of all necrotic tissue. In this series, we opted for a single-stage posterior approach to the thoracic spine due to its lower anesthetic risk and postoperative complications compared to other methods. This approach minimizes surgical intervention, cuts down operative time and morbidity, enables early mobilization, and lessens complications and costs related to extended bed rest and hospitalization.

In the present study the mean preoperative kyphosis in thoracic spine before surgery was 23.4 degrees and average kyphosis postoperatively was 10.3 degrees. Average kyphosis at the end of final follow-up was 14.6 degrees with a final correction of 8.8 degrees which is similar to earlier studies<sup>8, 9</sup>. There are many surgical complications associated with the above mentioned anterior surgical procedures such as excessive bleeding from the paravertebral venous plexus, tear of the pleura, risk of damage to aorta and pleura, and in patients who have pulmonary compromise, these approaches will further deteriorate the pulmonary function. If posterior instrumentation is required the surgeon should give a posterior midline incision. This combined procedure has a longer operation time, longer healing duration, and higher surgical trauma. In the present study out of 15

patients' one patient developed sinus 4 months after the operation, for which debridement and sinus excision was performed.

In conclusion, our study results indicate that spinal instrumentation is safe and crucial for stabilizing tuberculosis of the spine, even in the presence of active infection with pus. Instrumentation post-radical debridement doesn't increase recurrent infection risk. Single-stage decompression with fusion and kyphosis correction, although demanding, can potentially prevent neurological deficit progression and late-onset paraplegia recurrence in complex cases. Indeed, spinal stabilization can expedite healing and prevent kyphosis progression, thereby yielding substantial benefits.

## References

1. Maurya VK, Sharma P, Ravikumar R, Debnath J, Sharma V, Srikumar S, Bhatia M. Tubercular spondylitis: A review of MRI findings in 80 cases. *Medical Journal Armed Forces India*. 2018 Jan 1;74(1):11-7.
2. Qureshi MA, Khalique AB, Afzal W, Pasha IF, Aebi M. Surgical management of contiguous multilevel thoracolumbar tuberculous spondylitis. *European Spine Journal*. 2013 Jun;22:618-23.
3. Garg RK, Somvanshi DS. Spinal tuberculosis: a review. *The journal of spinal cord medicine*. 2011 Sep 1;34(5):440-54.
4. Dunn RN, Husien MB. Spinal tuberculosis: review of current management. *The bone & joint journal*. 2018 Apr 1;100(4):425-31.
5. Yang P, Zang Q, Kang J, Li H, He X. Comparison of clinical efficacy and safety among three surgical approaches for the treatment of spinal tuberculosis: a meta-analysis. *European Spine Journal*. 2016 Dec;25:3862-74.
6. Pu X, Zhou Q, He Q, Dai F, Xu J, Zhang Z, Branko K. A posterior versus anterior surgical approach in combination with debridement, interbody autografting and instrumentation for thoracic and lumbar tuberculosis. *International orthopaedics*. 2012 Feb;36:307-13.
7. Chen YC, Chang MC, Wang ST, Yu WK, Liu CL, Chen TH. One-stage posterior surgery for treatment of advanced spinal tuberculosis. *Journal of the Chinese Medical Association: JCMA*. 2003 Jul 1;66(7):411-7.
8. Garg N, Vohra R. Minimally invasive surgical approaches in the management of tuberculosis of the thoracic and lumbar spine. *Clinical Orthopaedics and Related Research*. 2014 Jun;472:1855-67.
9. Jha DK, Singh R, Pant I. Transpedicular surgical decompression of dorsal spinal tuberculosis (pott's disease) with vertebral collapse without fixation. *Neurosurg*. 2016;1:2.
10. Lifeso RM, Weaver P, Harder EH. Tuberculous spondylitis in adults. *JBJS*. 1985 Dec 1;67(9):1405-13.

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 Aug;39(8):429-36.
12. Blasberg JD, Donington JS. Infections and radiation injuries involving the chest wall. *Thoracic Surgery Clinics*. 2010 Nov 1;20(4):487-94.
13. Zhang H, Huang S, Guo H, Ge L, Sheng B, Wang Y, Guo C, Tang M. A clinical study of internal fixation, debridement and interbody thoracic fusion to treat thoracic tuberculosis via posterior approach only. *International orthopaedics*. 2012 Feb;36:293-8.
14. Ma YZ, Cui X, Li HW, Chen X, Cai XJ, Bai YB. Outcomes of anterior and posterior instrumentation under different surgical procedures for treating thoracic and lumbar spinal tuberculosis in adults. *International orthopaedics*. 2012 Feb;36:299-305.