

Original Article (SPINE)

## Transpedicular Fixation via Posterior Approach for Dorsal and Lumbar Spine Tuberculosis

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### ABSTRACT

**Objective:** To determine the outcome of Transpedicular Fixation via Posterior Approach for Dorsal and Lumbar Spine Tuberculosis.

**Material/Methods:** This study was cross-sectional and conducted from 01/02/2015 to 30/7/2020 in the department of neurosurgery. A total of 36 patients with dorsal and lumbar spine tuberculosis were operated on for transpedicular fixation. Assessment scores were used pre-operative and post-operative and patients were kept on follow-up till six months after the surgical procedure. Variables like age, gender, spinal level, preoperative, and follow-up clinical status were calculated.

**Results:** There were 19 (53%) male and 17 (47%) female patients with a mean age of  $27 \pm 8$ . Thoracolumbar was the commonest segment involved in 17 (47%) patients, followed by lower thoracic in 8 (22%) and lumbar in 7 (19%). There were 7 (19%) patients on the preoperative American Spinal Injury Association (ASIA) impairment scale in grade B, 12 (33%) in grade C, 15 (42%) in grade D, and 2 (5%) in grade E. The follow-up assessment at 6 months showed that ASIA grade B was seen in 3 (8%), grade C in 4 (11%), grade D in 16 (44%), and Grade E in 13 (36%) patients. Preoperative and follow-up scores on the ASIA impairment scale, COBS ANGLE, and ESR showed a significant difference ( $p$ -value  $< 0.05$ ).

**Conclusion:** We concluded that transpedicular fixation can restore the stability of the spine in thoracic and lumbar tuberculosis. The procedure is important for the improvement of clinical symptoms, correction of kyphosis, and stabilization of the spinal column.

**Keywords:** Transpedicular fixation, caries spine, spinal instability.

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## INTRODUCTION

Tuberculosis (TB) has been a global affliction. Its presence was reported as early as 9000Bc in the Mummies of Egypt and Peru. It has also been mentioned in the earliest medical treatises of India, the Sushruta Samhita (600BC) and the Charaka Samhita (1000BC).<sup>1,2</sup> Only about 1 – 2% cases count under spinal tuberculosis if compared to overall tuberculosis cases and spinal TB is responsible for about 50% of cases extrapulmonary tuberculosis comprises ten percent of all TB cases.<sup>3</sup>

Developing countries still bear the fatal and widespread effects of tuberculosis, a few of the factors are addiction, overcrowding, poverty, immunodeficiency, and drug abuse. For the health care system, it's a challenge as the disease is communicable, with high morbidity and mortality. Eight million people are infected by TB and around 2 million people among them are dying annually.<sup>4</sup>

Posterior fixation with rods and screws has dramatically changed the management of spinal TB, especially since it helps prevent severe back pain and kyphosis. Additionally, it improves spinal stability.<sup>5</sup>

TB spine majorly affects spinal stability and causes spinal kyphotic deformity which leads to the pain and associated symptoms of cord compression.<sup>6</sup> The management of TB spine remains a challenging task, guidelines on the optimal treatment and management planning. Conservative treatment includes bed rest, abdominal closets, medications, as well as a healthy diet. Surgery remains the better option for patients who are resistant or refractory to medication and have progressive neurological deficit or instability. Prolonged antituberculous therapy for 18 months burdens the patient socially and economically as well as affects the quality of life.

Surgical options that are available to the patient are anterior-posterior spinal fusion,

posterior fusion followed by anterior spinal fusion, anterior spinal fusion followed by posterior, or alone otherwise but the indication for each surgical indication may vary from patient to patient, based on the experience of the surgeon.<sup>7</sup> Anterior approach is used frequently in the clinical setting for TB spine, but in contrast, it is more time consuming and due to the surgical position, it may traumatize the supporting tissues such as the peritoneum and may cause the spread of infection. The combined anterior and posterior fixation approach takes a longer operating time, leading to more blood loss and more postoperative complications.<sup>8</sup>

It is found that the Posterior fixation edge on anterior fixation on correcting the kyphotic deformity and maintaining spinal stability. Single-stage approach via posterior surgery can be as beneficial and efficient as an anterior approach or combined both procedures, with shorter operative times, less blood loss, and less trauma.<sup>9</sup> But the main aim of all these approaches is to benefit the patient and minimize the spread of disease in the spine either single-stage anterior fusion and fixation, posterior fusion and fixation, or both depending on the patient's spread of TB.<sup>10</sup>

The rationale of the research was to detect the patient suffering from spine tuberculosis and stenosis. This study determines to prerequisite patients whether transpedicular fixation impose or not. Symptoms are identifying the condition of the patient and complications of the disease. It was demonstrating the methodologic issues, method of sampling and analysis, diagnostic procedures, clinical examination procedures, outcomes, treatment methods, and checkout and updated information during follow-up sessions associated with lumbar spine tuberculosis.

## MATERIALS AND METHODS

### Study Type

This study was a Cross-sectional study, completed and permitted through the Institutional Review Board, and consent was taken from all participants.

### Study Setting and Duration

The study began on 01/02/2015 and finished on 30/7/2020, the clinical data were reported with 36 cases of patients with dorsal and lumbar spine tuberculosis that were treated in the department of neurosurgery with one phase posterior approach debridement, decompression, and transpedicular fixation.

### Inclusion and Exclusion Criteria

The study design belongs to the implementation of the art of transpedicular fixation procedures for spinal tuberculosis. The Inclusion criteria set for this study were patients with diagnosed cases of tuberculosis, not responding to medication or effects not up to the mark, patients developing neurological deformity, severe pain. Exclusion criteria included patients previously operated on for the same pathology or severe kyphotic deformity.

### Diagnosis & Treatment

The diagnosis of spine tuberculosis was founded on history, clinical symptoms, imaging features including magnetic resonance imaging and X-rays films, and clinical laboratory examinations involving complete blood count (CBC), evaluation of erythrocyte sedimentation rate (ESR), and C-reactive protein (CRP). We managed all patients with one-stage surgical treatment (transpedicular screw fixation) that is via a posterior approach.

### Data Collection Procedure

All the enrolled patients were assessed pre-operatively and post-operatively and at the follow-up for the following scores: the American

Spinal Injury Association (ASIA) impairment scale, the Japanese Orthopedic Association (JOA) scores, COB's angle, and Erythrocyte Sedimentation Rate (ESR). Patients were kept on follow-up till six months after the surgical procedure with the related investigation as per the study procedure.

### Data Analysis

The data was collected on predesigned proforma and later analyzed through SPSS. The parameters like age, gender, spinal level, and pre-operative and post-operative clinical status were determined as frequency. The chi-square was applied to see the comparison between pre-operative and post-operative assessment grades,  $p$ -value  $<0.05$  taken as significant.

## RESULTS

### Gender and Age

The study had 19 (53%) males and 17 (47%) female, patients. The mean age of the patients in our study was  $27 \pm 8$ .

### Segmental Involvement

Diseased upper thoracic segments were observed in 1 (3%) patients (D5 – D6). Diseased lower thoracic segments were observed in 8 (22%) patients (3 patients D6 – D7, 3 patients D7 – D9, 1 patient D7 – D8, 1 patient D8 – D10). Thoracolumbar segments in 17 (47%) patients (2 patients in D9 – D10, 4 patients in D10 – D11, 3 patients in D11 – D12, 5 patients in L1, 2 patients in L1 – L2, and 1 patient in D12 – L1). Lumbar segments in 7 (19%) patients (2 patients in L1 – L3, 3 patients in L3 – L4, and 2 patients in L3 – L5). A lumbosacral segment in 3 (8%) patients (L5 – S1).

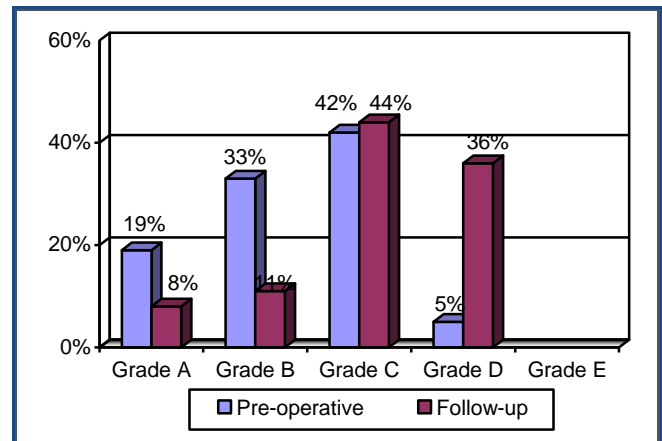
### Assessment Score

The American Spinal Injury Association (ASIA) impairment scale was applied to assess the preoperative neurological dysfunction given in figure1. There were 7 (19%) patients in grade B, 12 (33%) in grade C, 15 (42%) in grade D, and 2 (5%) in grade E. The follow-up assessment at 6 months showed that ASIA grade B was seen in 3 (8%), grade C in 4 (11%), grade D in 16 (44%), and Grade E in 13 (36%) patients.

### Comparison between Pre-operative and Post-operative Assessment Score

The ASIA impairment scale result is compared with the help of the paired t-test. The result shows that it is a significant difference (p-value < 0.05) between preoperative and after follow-up patients. JOA score is also having a significant relationship (p-value < 0.05) between preoperative and after follow-up. The result of COBS ANGLE and ESR MM/HR were also found

significant in our study (p-value <0.05) shown in table 1.



**Figure1:** Pre-operative and post-operative ASIA impairment scale observed in studied patients.

**Table 1:** Comparison between Pre-operative and Follow-up Assessment Score.

Scoring System	Assessment Time	Average	S.D	Paired t-test P-value
JOA Score	Pre-operative	14.58333	4.97982	1.139
	At follow-up	30.38889	8.838922	Insignificant
ESR mm/hr	Pre-operative	83.11111	22.06906	1.139
	At follow-up	13.80556	6.150065	Insignificant
COBS Angle	Pre-operative	6.333333	25.05439	0.034
	At follow-up	5.138889	14.7029	Significant
Asia Score	Pre-operative	5.32424	645.6571	0.003
	At follow-up	4.45464	222.3516	Significant

### DISCUSSION

Spinal tuberculosis is still the worst disease, especially in Asian countries. The renewal of spinal stability becomes a better treatment for spinal Tuberculosis compared to the anterior approach for spinal tuberculosis, the posterior fusion and fixation plus debridement became the more famous method of treatment of spinal TB. Nowadays, the procedure of surgical treatment related to spinal TB has been imposed with minor

incision, internal fixation with statically, and focus on one approach during operation.

One of the studies states that Antituberculous therapy is still streamed line treatment and surgery is an indication for the patient having are limited conservative approach and medication are still valid to treat spine tuberculosis and surgical strategy can vary from patient to patient.<sup>11</sup>

Another study in their results showed that 29 patients had thoracic spine involvement, 16 had

thoracolumbar and 10 patients had lumbar, they had a follow-up of thirty months and the patient mean age was 47 years while a common indication of surgery was severe pain.<sup>12</sup> Visual analog scale score showed improvement from 9.2 to 2.4 in the postoperative period. 78% had bony fusion with good. Decompression posteriorly and transpedicular screw fixation had better neurological improvement and improved functional outcomes with good spinal alignment.

While another study showed that the blood loss was around 726 ml and time duration was 210 minutes, while they had a comparison between long and short segments but we are presenting the results of short-segment fixation groups, cure in the short segment was around 85% seen at post-surgery after 6 months and the bony fusion rate in the short segment was 87.18% at 6 months after operation between vertebral fixation and short segment fixation and the study concluded that posterior fixation on involved vertebrae was effective, safe also the feasible method in the treating of tuberculosis.<sup>13</sup>

Xu Z et al stated that single or one-stage posterior bone graft, debridement and titanium cage in single-segment was an important treatment option in lumbar spine tuberculosis treatment in adults.<sup>14</sup> In one of the studies comparing the two approaches that are an anterior approach for Tb and a posterior approach, they found that the clinically posterior approach had a better outcome.<sup>15</sup> However, final selection should vary from case to case on individual assessment and presentation.

While considering another study suggests that the surgical treatment should be reserved for the deformity in advanced stage and paraplegic patients while the mainstay should always be the TB chemotherapeutic drugs and pain with lower back pain should have tuberculosis in the differential diagnosis.<sup>16</sup>

Also, another study recommends a posterior approach for thoracic spine developing kyphosis for unstable spine or having neurological deficit

the study state that the stabilization, decompression, fusion, and correction of kyphosis can be safely performed via a posterior approach.<sup>17</sup>

While in another study the average age was around forty years.<sup>18</sup> Male were 42% and females were 57% male. Locality wise Lesion was 66.7%, 19.0%, and 14.3% found in the dorsal, lumbar, and dorsolumbar areas respectively. Grade C ASIA score was 43% while grade D was seen at 33%. The following study showed excellent outcomes in 80%, Good outcomes in 14%, and 4% had fair outcomes inclined towards the Posterior fixation approach as a better surgical intervention that helps in neurological outcomes and recovery.

## CONCLUSION

We concluded that transpedicular fixation can restore the stability of the spine in thoracic and lumbar tuberculosis. The procedure is important for the improvement of clinical symptoms, correction of kyphosis, and stabilization of the spinal column. The outcome of spinal tuberculosis through transpedicular fixation with internal fusion is good. This study is based on a short range of follow-up and demands a more extensive follow-up study with an additional number of patients.

## LIMITATIONS

There are some limitations to implementing this technique. The potential increased risk of TB from first posterior debridement to the healthy posterior regions, factors of increased infection dispersion, and fistulas. These are the complication that has not been seen in the present study. The reason to achieve the complete debridement and decompression in this procedure was to evaluate the factor of damage to the spinal cord in a normal posterior column. It would be marked the stability of the spinal cord. There is a need for long-term follow-up checkups



to achieve the stability of the spine. While non-compliance with the drug is another problem.

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## 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.

**Other Relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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## AUTHORS CONTRIBUTIONS

Sr.#	Author's Full Name	Intellectual Contribution to Paper in Terms of:
1.	Sher Hassan	1. Study design and methodology
2.	Aurangzeb Kalhoro	2. Paper writing and data calculations
3.	Lal Rehman	3. Data collection and calculations
4.	Abdul Samad Panezai	4. Analysis of data and interpretation of results etc.
5.	Farrukh Javeed	5. Literature review and referencing.