

Original Article (SPINE)

Efficacy of Posterior and Posterolateral Approach for Decompression and Fusion for Thoracolumbar Tuberculosis

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ABSTRACT

Objective: To study the efficacy of the posterior and posterolateral approach in thoracolumbar tuberculosis.

Material and Methods: 60 patients with thoracolumbar TB spine were enrolled in the study from 2015 to 2021. These patients had single-level disease with low back pain and neurological compromise in lower limbs. The diagnosis was made on an MRI of the spine and elevated ESR levels. All patients were started with antituberculous treatment. The pain was measured on the VAS score, and neurological status was assessed on the ASIA score. Kyphosis angle was calculated on a lateral x-ray of the spine. All patients were operated on by posterior and posterolateral approaches with decompression and fusion. At follow-up, fusion was assessed on every visit by x-ray along with neurological status and pain score.

Results: The mean age of patients was 45.8 years (25 to 66 years). 59.5% patients achieved radiological fusion on follow-up x-rays. There was a significant improvement in VAS score preoperatively mean and SD 6.38 ± 1.24 to postoperatively 4.45 ± 1.09 . The mean and SD of kyphosis in patients preoperatively was 22.3 ± 3.06 to post-operative 22.3 ± 3.06 with a p-value < 0.05 which shows significant improvement.

Conclusion: Posterior and posterolateral decompression and fusion of thoracolumbar tuberculosis is a good surgical approach in respect of neurological outcome, correction of kyphosis, and pain improvement.

Keywords: TB (tuberculosis) spine, ESR (erythrocyte sedimentation rate), VAS (visual analog scale), ASIA (American spinal cord injury association).

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INTRODUCTION

TB spine or pott's disease is a common spine problem in our area. It affects every age group and both genders. TB spine is primarily an anterior pathology of the spine with the involvement of vertebral bodies and intervertebral discs. This results in spondylodiscitis, pus formation, and paravertebral collections. This inflammatory material causes

spinal canal compromise and spinal cord compression resulting in neurological deficits. Vertebral body destruction results in spine instability and bone pains.¹⁻⁴ Initially, antituberculous chemotherapy is given. These are 4 chemotherapy drugs: isoniazid 5 – 10 mg/kg/day, rifampicin 10 – 15 mg/kg/day, ethambutol 15 – 20 mg/kg/day and pyrazinamide 25 – 35 mg/kg/day. This regimen is continued for 03 months and later on, only isoniazid and rifampicin are continued for 12 months. Most patients get better with antituberculous medications. 10 to 40% of patients develop the worst complication of TB spine i.e., paraplegia.^{5,6}

Surgical treatment is required for decompression, drainage of pus, debridement of dead tissue, and granulation of tissue.^{7,8} Surgical treatment is indicated in cases of failure of medical treatment, clinical instability, and neurological deterioration. This improves vascularity and drug delivery to the affected site and improves bone fusion.^{9,14}

As far as the surgical approach is concerned, the traditionally anterior transthoracic approach was being done but this has high morbidity with old and frail patients, vascular complication, anesthesia complications, and graft site problems. Recently there is a trend of posterior spine stabilization, decompression, and fusion surgeries with lesser risk of complications. The rationale of this study is to evaluate the efficacy of posterior and posterolateral decompressions and fusion surgery in the active stage of thoracolumbar tuberculosis.^{10,11}

MATERIAL AND METHODS

Study Design and Setting

A retrospective case study series was conducted Neurosurgery department of Bakhtawar Amin Medical College and Hospital Multan, 2015 to 2021.

Inclusion Criteria

60 patients with thoracolumbar TB spine were included in the study from 25 to 65 years. All patients were included from OPD having thoracolumbar TB spine. These patients had back pain and neurological compromise in lower limbs. There was the involvement of 2 adjacent levels.

Exclusion Criteria

Multilevel involvement of vertebrae was excluded from the study. Patients having severe osteoporosis, degenerative disease of the spine, and comorbid were also excluded.

Sampling technique and Sample Size

The sampling technique was simple random probability sampling. 60 patients were included in our study.

Clinical Management

60 patients with thoracolumbar TB spine were included in the study from 25 to 65 years. TB spine was diagnosed on MRI thoracolumbar spine. ESR and x-ray chest were also done for confirmation of disease. All patients were started with antituberculous treatment. Neurological evaluation was done by ASIA score.²¹ Pain status was evaluated by a VAS score.²² The angle of kyphosis of the thoracolumbar spine was calculated by lateral x-ray of the spine by a method by Rajasekaran.¹²⁻¹³ Patient informed consent was taken for the inclusion of radiological scans in a research article.

Surgical Management

The surgical procedure was done by a consultant neurosurgeon under general anesthesia. The patient was placed in a prone position with one bolster placed under the chest and one under the pelvis with abdomen muscles free hanging. The prone position also improved kyphosis. A

posterior midline incision was given and after muscle dissection anatomical landmarks were identified. Transpedicle screws were placed at levels above and below the diseased level under fluoroscopic guidance. Then decompression started with the removal of lamina and drainage of epidural collection. To do anterior decompression, the posterolateral approach was used. This facetectomy was done initially and then the pedicle was removed on one side. Nerve root retracted upward and disc space entered and debridement was done. The endplates were curetted till healthy bone was bleeding. The bone graft was placed in the dead space. Rods were applied and posterolateral fusion was done on both sides.^{14,15}

In the postoperative period, the patient was allowed to sit in bed for about 1 – 2 weeks with a thoracolumbar Boston brace. They were allowed to mobilize slowly. Boston brace was discontinued after 8 to 10 months.^{15,16}

Follow-up

Patients were discharged from the hospital when hemodynamically and neurologically stable. They were advised to follow up initially after 2 weeks, then monthly. Radiographs were taken on every visit. Then 3 monthly followup were planned. On each visit, pain improvement and neurological status were assessed. X-ray was also done to assess the status of pedicle screws, alignment of the spine, status of fusion, angle of kyphosis, and mineralization of bones. Antituberculous treatment was also continued with monitoring of liver function tests and ESR. Post-op MRI of the thoracolumbar spine was done after 3 months of surgery to determine the resolution of abscess and spinal cord decompression. Analysis was done in SPSS version 23. To assess the significance of the relationship between numeric variables, paired sample t-test was used and a p-value < 0.05 was taken as significant.

RESULTS

Age and Gender Distribution:

60 patients were operated. The mean age of patients was 45.8 yrs (25 to 66 years). There were 67% males and 23% females.

Clinical Information

Mean vertebral body destruction was 0.75. The mean follow-up of patients was 36.4 months. Blood loss in this procedure was 250 to 590 ml (422.5 ml).

59.5% of patients achieved radiological fusion on follow-up x-rays. The remaining patients did not achieve fusion. Even those patients who do not achieve fusion had no pain postoperatively and their neurology also improved on follow-up.

ASIA scoring was done on patients preoperatively and postoperatively. Preoperatively 9 patients were ASIA= A, 13 patients were ASIA = B, 20 patients were ASIA = C, 13 patients were ASIA = D, 05 patients were ASIA = E. Postoperatively 10 patients were ASIA = B, 21 patients were ASIA =C, 17 patients were ASIA = D and 12 patients were ASIA = E (Table 1).

Table 1: Improvement of ASIA score postoperatively.

ASIA Score	Pre-operative (Number of Patients)	Post-operative (Number of Patients)
A	9 (15%)	0
B	13 (21.7%)	10 (16.7%)
C	20 (33.3 %)	21 (35%)
D	13 (21.7%)	17 (28.3%)
E	05 (8.3%)	12 (20%)

Complications

Postoperative complications occurred in 2% of patients. 3 patients developed superficial wound infections, 2 deep wound infections, and 4 patients developed urinary tract infections. There is no failure of implants.

Analytical analysis

As far as pain improvement on the VAS scale after surgery, there was a significant improvement in VAS score from preoperatively mean and SD = 6.38 ± 1.24 to post-operatively 4.45 ± 1.09 . The p-value is 0.00 which shows that the pain of patients being operated on by posterior decompression and fusion improved significantly postoperatively (Table 2).

Table 2: Analysis of VAS score and kyphosis angle using Wilcoxon Matched-Pair Test.

	Pre-operative (Mean and SD)	Post-operative (Mean and SD)	p-value
VAS scale	6.38 ± 1.24	4.45 ± 1.09	0.00
Kyphosis angle	22.3 ± 3.06	22.3 ± 3.06	0.00

There was a significant improvement in kyphosis angle post-operatively. The mean and SD of kyphosis in patients preoperatively were 22.3 ± 3.06 to postoperative 20.9 ± 3.08 with a p-value of 0.00. Significant kyphosis angle improvement postoperatively shows that posterior fixation of TB spine patients by pedicle screws and rods achieved good normal curvatures of the spine (Figure 1).

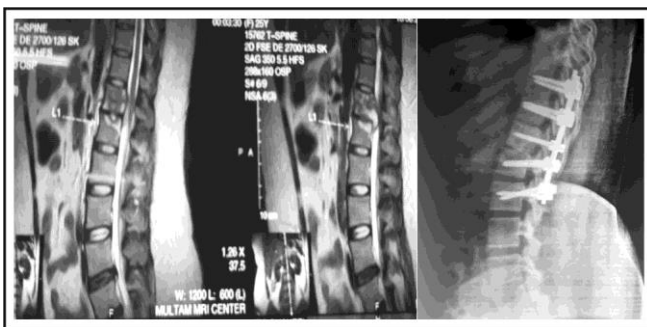


Figure 1: Preoperative and postoperative imaging of TB spine. (Image used with patient's consent)

DISCUSSION

TB spine is primarily an anterior pathology. It mainly affects the vertebral bodies and

intervertebral discs. Traditionally the anterior disease is addressed by the anterior transthoracic approach. In that approach the patient's surgery is being done in the lateral position, thoracotomy is done with debridement of dead tissue and pus, and anterior decompression of the spinal cord stabilization with a titanium cage. The transthoracic approach has its complication. These patients are already anemic, malnourished, old, and frail. Postoperative chest intubation is also being done which has also its complications and patients need prolonged pulmonary rehabilitation after surgery. Nowadays with new imaging technologies like advanced MRI and CT scans, the details of the pathology can be understood and surgical planning can be done preoperatively.^{3,6,13,17} With modern antituberculous regimens, the treatment course and management have been changed revolutionary. It has been studied that > 75% of patients can be treated and fusion can be achieved with medical treatment with antituberculous regimens. The spinal cord of patients can tolerate > 76% of spinal canal compromise with the pathology. Nowadays posterior instrumentation and decompression have been proposed with lesser morbidity. Guaven first proposed the posterior approach with transpedicular decompression and drainage of pus and correction of kyphosis.^{4,10,15} He recommended that patients having < 40 degrees of kyphosis and < 50% of collapse and negative CT-guided biopsy are good candidates for the posterior surgical approach.

As far as correction of kyphosis is concerned postoperatively, the anterior surgical decompression and fusion with titanium mesh cage have more correction of kyphosis from 11 to 40.9 degrees and if in these cases, we add posterior instrumentation also, there is no additional correction of kyphosis.^{5,13,20,18} As far as posterior instrumentation is concerned alone in the correction of kyphosis, the literature states that there is the correction of kyphosis from 3.0

to 6.0 degrees. In our study, the kyphosis angle postoperatively is 3.0 degrees less than in preoperative cases which matches the international literature. In conclusion, there is the correction of kyphosis in both anterior and posterior approaches, but it is less in the posterior segmental fusion approach^{9,13,4} (Figure 1).

As far as improvement of VAS score is concerned postoperatively, it depends on surgical technique. When posterior fusion was started, it consists of only decompression, fixation, and drainage of pus only. In our study, we extended our approach with decompression, removal of the lamina, facet joints, pedicles, and posterolateral decompression, and filling of defect with bone graft. Fusion was done with pedicle screw fixation and rods. VAS score reduced post-operatively significantly because of stabilization of the unstable spine.^{5,15,16,9}

In the evaluation of neurological improvement postoperatively, Lee et al have done a study to compare the results of neurological improvement postoperatively in anterior and posterior decompression. They concluded that patients had complete neurological recovery but most patients were ASIA grade D or E. In our study patients were in severe ASIA grade (A or B) and they recovered to ASIA D or E. The improvement in neurological outcomes in our study which favors the posterior approach.^{9,14,19,5}

Spinal fusion is observed in 60% of patients who were operated on in our study. This is radiographic fusion but those patients who have not observed radiological fusion, are also pain-free and have neurological recovery. Other literature evidence also shows that there is also no radiological evidence of solid fusion in these cases but they all have good alignment of spine and pain relief. The reason why there is a low fusion rate in our study is that we have done early surgical intervention in our cases and there is no destruction of endplates.^{18,4,9,14}

CONCLUSION

In our study, we concluded that posterior and posterolateral decompression resulted in a good neurological outcome, better correction of kyphosis, and pain improvement in patients with thoracolumbar TB spine. We do not underestimate the anterior surgery of the spine but that has great morbidity.^{2,18,19,20}

Limitation of Study

The study being conducted on a limited number of patients. This also correlates with the previous studies. We have not taken multilevel disease in our study which affects kyphosis angle and neurological compromise. The angle of kyphosis is also affected by normal variation in thoracolumbar kyphosis.

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Additional Information

Disclosures: Authors report no conflict of interest.

Ethical Review Board Approval: The study was retrospective, however, it conformed to the ethical 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.

AUTHOR CONTRIBUTIONS

Sr. No.	Author's Full Name	Intellectual Contribution to Paper in Terms of
1.	Muhammad Adeel Razaque	Study design, methodology, and paper writing.
2.	Waqas Noor Chughtai	Data calculation and data analysis.
3.	Sumera Nightat	Interpretation of results.
4.	Muhammad Tahir	Statistical analysis.
5.	Shakeel Ahmad	Literature review.
6.	Moazma Nawaz	Literature review and quality insurer.