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## A prospective study of functional outcome in Thoracolumbar potts spine with posterior only approach

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### Abstract

**Introduction:** surgical approach for thoracolumbar pott spine has been controversial. Traditionally, earlier anterior decompression and fixation had been long considered as the gold standard for treatment of tb of spine. Recently, the posterior approach has gained popularity based on the principle of adequate debridement, decompression and stable fixation with much lower complication rates, the present study aims to evaluate the results (functional, neurological, and radiological) of the posterior only approach in patients operated for thoracic and lumbar tuberculosis.

**Methods:** all patients (n=40) who were included in the study had thoracolumbar tuberculosis of spine with or without neurological deficit and with or without deformity, were managed by only posterior decompression and fixation. Preoperative and postoperative visual analog scale, frankel neurological grading, radiologic fusion by bridwell criteria were compared and functional assessment was done by Oswestry disability questionnaire.

**Results:** Statistical significant improvement seen in Oswestry disability functional questionnaire and VAS scores ( $p < 0.05$ ), the clinical outcomes were satisfactory at the end of final follow-up. no worsening of neurological deficit. Solid fusion was achieved in 85% patients after surgery. Two patient developed superficial wound infection which healed by Conservative methods and extended antibiotic therapy.

**Conclusion:** Posterior decompression and fixation is safe and effective approach for management of patients with thoracolumbar pott spine, provides rapid relief of pain, neurological recovery by adequate decompression and prevents progression of deformity with posterior stabilization with fewer complications.

**Keywords:** TB spine, posterior decompression and stabilization, posterior approach thoracolumbar spine

### Introduction

The World Health Organization's Global tuberculosis report 2015, stated that tuberculosis as a leading cause of death worldwide with 1.4 million deaths in 2014 <sup>[1]</sup>. Spine is the most common site for osseous involvement of tuberculosis accounting for around 50% of musculoskeletal tuberculosis cases <sup>[2]</sup>. Thoracic spine is most commonly affected and involvement of lumbar and lumbosacral region is less common <sup>[3, 4]</sup>. Vertebral involvement in tuberculosis may lead to potentially catastrophic complication, paradiscal involvement i.e. intervertebral disc and the end plates of the adjacent superior and inferior vertebral bodies are often involved in TB, severe destruction of these elements often leads to kyphotic deformities <sup>[3, 4]</sup> Spinal cord/nerve root compression secondary to a tubercular epidural abscess leads to neurological deficit <sup>[3]</sup>

With advent of magnetic resonance imaging (MRI), early detection of disease is possible and effective antitubercular therapy has allowed disease cure in majority of patients with conservative management alone <sup>[5]</sup>. However, surgery is indicated in patients having disabling back pain and or progressive neurological deficit despite conservative management <sup>[5, 6]</sup>.

Approach for surgical treatment of thoracolumbar tuberculosis is always controversial. The goals of surgery in Pott's spine are adequate decompression, adequate debridement, maintenance and reinforcement of stability and correction and prevention of deformity.

Traditionally, Anterior decompression and fixation have been long considered as the gold standard for treatment of TB of spine because the anterior approach allows direct access to

infected tissue, thereby providing good decompression [5]. More operation time, more blood loss and greater duration of hospitalization are its main disadvantages. In addition graft failure and loss of correction, residual kyphosis at the end of treatment are frequent complications [6]. Recently, the posterior approach has gained popularity based on the same principles with much lower complication rates, Posterior approach allows circumferential decompression of neural elements along with three-column fixation attained via pedicle screws [5, 6]. The present study aims to evaluate the functional results of the posterior only approach in patients operated for Thoracic and lumbar tuberculosis.

## Materials and methods

Type of study- Prospective study

Inclusion Criteria-

- Age – 18 years and above with Informed consent
- Patients with progressive pain and neurological deficits not responding to 6 weeks of chemotherapy (Antitubercular treatment)
- significant vertebral body destruction or collapse / kyphotic angle less than 60°

## Methods

50 Patients were taken in the study initially but out of them 10 did not come for regular follow up. So study consisted of 40 patients. Among all these (n=40) Diagnosis of active TB was made based on clinical symptoms, thorough general and local examination, laboratory findings (complete blood Count, erythrocyte sedimentation rate [ESR], C-reactive protein [CRP], and radiographic evidence (X-ray dorsolumbar and lumbosacral spine, chest X-ray, and magnetic resonance imaging). Patients who had one of these manifestations were confirmed postoperatively through histopathological study. On confirmation of diagnosis, all patients were put on antitubercular treatment (2HREZ/9-12HRE).

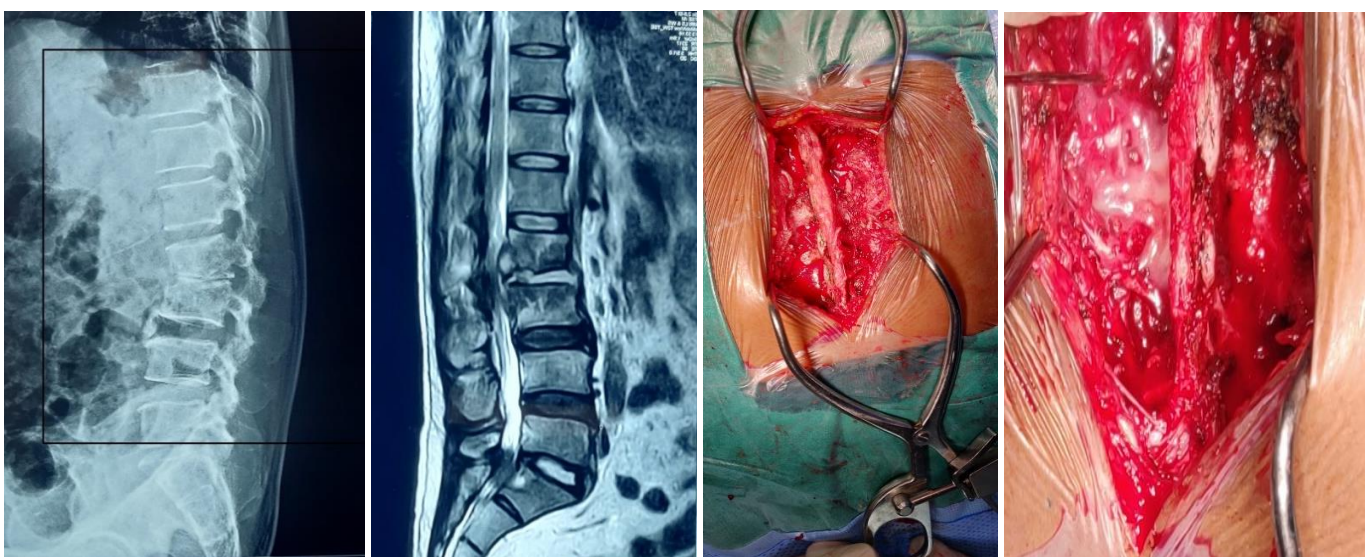
Patient's pain was assessed on the basis of visual analog scale (VAS) score, and the neurological status was assessed with Frankel grading, Fusion assessment by bridwell criteria, and Functional score will be obtained using Oswestry's

disability index.

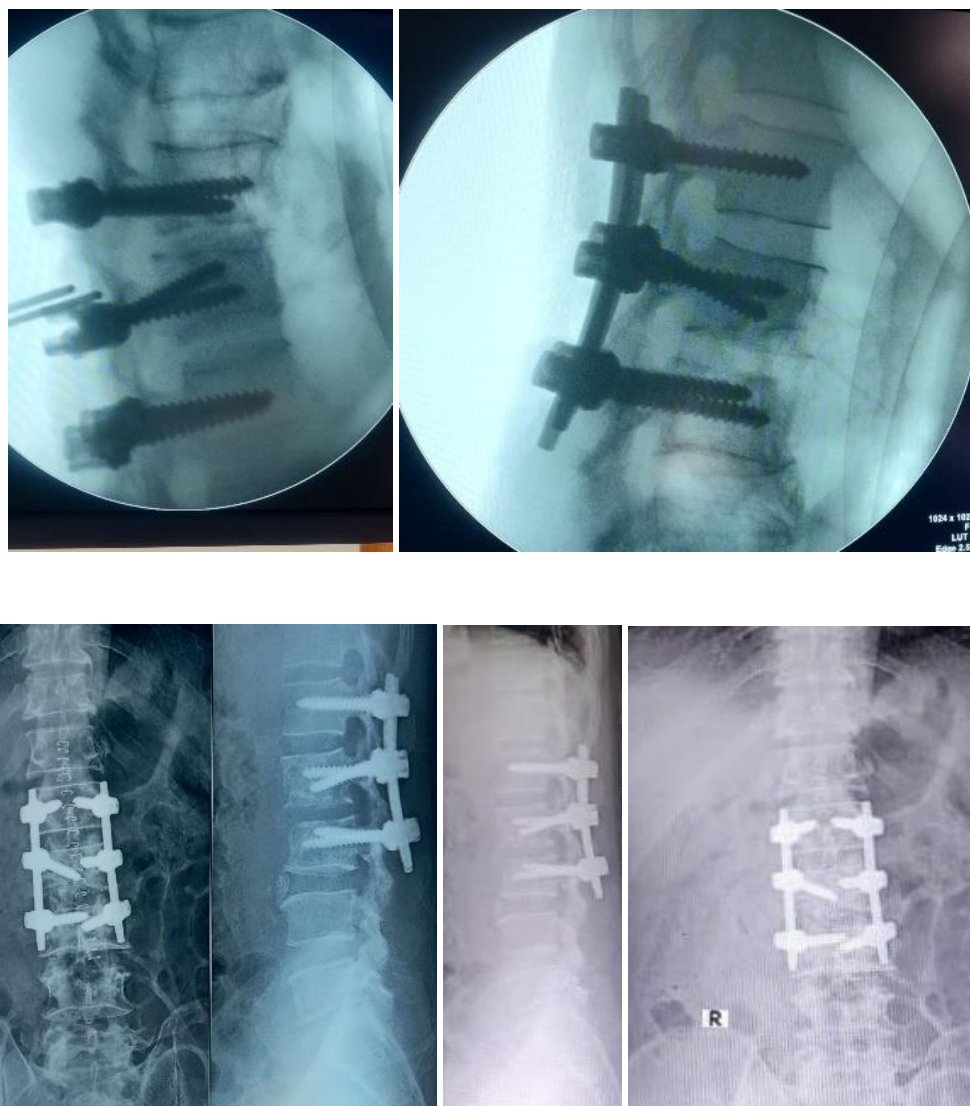
The radiographic assessment included preoperative kyphotic angle which was measured on X-ray by Cobb's method as the angle between the upper end plate and the lower end plate of the infected level. All of 40 patients were managed by only posterior decompression and fixation. Our study aimed to evaluate the functional outcome with posterior only approach in thoracolumbar tuberculosis, with respect to Post-operative neurological improvement, post-operative deformity correction and fusion.

## Operation technique

All patients underwent general endotracheal anaesthesia, after which they were placed in the prone position on the spinal table. A standard dorsal midline incision was performed, and the posterior elements were exposed. Pedicle screws were inserted, and the correct placement was confirmed by intraoperative C-arm fluoroscopy. In general, the two superior and two inferior healthy vertebrae were embedded into the pedicle screw to ensure rigid spinal stability. A temporary pre-bent rod was installed on the side where the lesion was relatively mild in order to avoid spinal cord injury during decompression and focal debridement. A unilateral or bilateral Laminectomy was done according to the extent of cord compression. Then facetectomy and pediculectomy were performed at appropriate levels. The surgical area was irrigated with large quantity of saline. Any abscesses, granulation tissue, sequestra, caseous necrosis, necrotic endplates and discs materials were debrided as thoroughly as possible via the transpedicular space. Then, a pre-bent rod was temporarily installed on the other side and the rod installed previously was removed. The same process was performed on the side opposite to the lesion. Posterolateral fusion using autograft of suitable size containing cancellous bone from the iliac crest was performed. The compression and expansion of the internal fixation instrument was used to rectify the kyphosis and scoliosis gradually and carefully, then the contoured rods were tightened, and a local drainage tube was placed in the operation site before the incision was closed.



Preoperative xray (lateral view) and T 2 wt MRI suggestive of L2-L3 level



Immediate postop

3 months followup

### Post-operative care

The drainage tube was removed when the amount of post-operative drainage was less than 10 ml/day. Preventive antibiotic treatment was administered during the first 48 h after the operation. All patients were recommended to wear the bracing apparatus until bony fusion was observed by radiography. Patients resumed oral Isoniazid, rifampicin, ethambutol, and pyrazinamide (HREZ) chemotherapy postoperatively, then pyrazinamide was discontinued after 2 months. Patients continued to receive a regimen of HRE chemotherapy for 9 to 12 months (2HREZ/9-12HRE). The liver function and ESR rates of the patients were carefully monitored at regular intervals. Follow-up examinations were conducted at 1, 3, 6 and 12 months postoperatively. Subsequent follow-up examinations were performed at 12-month intervals.

### Observations and results

We treated 40 patients of which were 26 male, and 14 were female. Majority of the patients in our study, i.e. 16 patients (40 %) were in the age group of 31-40 years, the majority of people are over 30 years (80 %). with minimum age of 18 years and maximum of 66 years ( $41.05 \pm 12.331$  years).

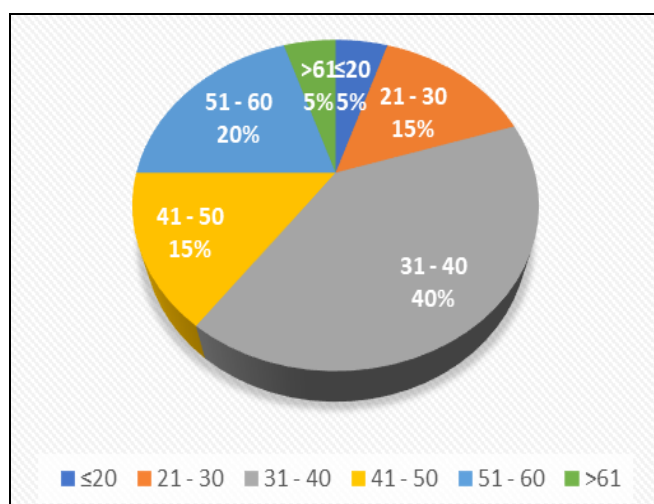


Fig 1: Age Distribution.



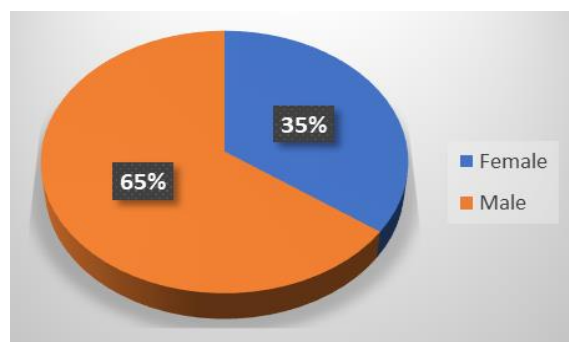


Fig 2: Gender distribution

Preoperatively, the ESR was elevated in 24 cases (60%) and the CRP level in 29 cases (72.5%). The ESR returned to normal in 18 cases by 3 months postoperatively. Normal values of ESR were attained in all 24 patients at final follow up. The CRP level had fallen to normal values in all the 29 cases at the end of 3 months after surgery

The mean VAS scores at pre-op period was  $8.45 \pm 1.32$ , at 6 weeks' post-operative period was  $2.95 \pm 0.76$ , at 3 months was  $2.50 \pm 0.83$ , at 6 Months was  $1.95 \pm 0.75$  and at 12 months period, it was  $1.60 \pm 0.88$ . This difference in the mean VAS scores between different time intervals was statistically significant at  $P < 0.05$ .

Table 1: Comparison of mean VAS scores b/w different time intervals using Paired Samples Test

Comparison of mean VAS scores b/w different time intervals using Paired Samples Test									
		Paired Differences					t	df	Sig. (2-tailed) p-value
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
1.	VAS SCORE PRE-OP - VAS SCORE POST-OP	5.500	1.051	.235	5.008	5.992	23.396	19	.000
2.	VAS SCORE PRE-OP - VAS SCORE 3 MONTH	5.950	1.191	.266	5.393	6.507	22.342	19	.000
3.	VAS SCORE PRE-OP - VAS SCORE 6 MONTH	6.500	1.318	.295	5.883	7.117	22.057	19	.000
4.	VAS SCORE PRE-OP - VAS SCORE 12 MONTH	6.850	1.348	.302	6.219	7.481	22.717	19	.000

34 (85%) out of 40 patients showed signs of neurological recovery. 20 patients (50%) recovered neurologically to Frankel grade E out of whom preoperatively 10 patients were in grade D, 4 in grade C, and remaining 6 patients were grade 3 preoperatively and had symptoms of severe backache with radiculopathy

16 patients (40%) recovered neurologically to Frankel grade D out of whom preoperatively 10 patients were in grade C, 6 in grade B. Among two patients with preoperative grade A, Only 1 patient has improved to grade C and the other patient (5%) in grade A did not show any signs of recovery.

Table 2: Frankels grading

		FRANKEL;S 12 MONTH				Total
		A	C	D	E	
FRANKEL;S PRE-OP	A	1	1	0	0	2
	B	0	2	6	0	8
	C	0	0	10	4	14
	D	0	0	0	10	10
	E	0	0	0	6	6
Total		1	3	16	20	40

Among 40 patients at final follow-up, 34(85%) patients had definitive fusion grade 1 of bridwell score. 5 (10%) patients had probable fusion grade 2 of bridwell score, whereas only 1(5%) patients had probably not fused.

Average preoperative kyphosis angle was  $22.9^\circ$  (SD 3.2) which could be corrected to an average of  $15.62^\circ$  (SD 2.2) postoperative. At final follow-up, there was a mean loss of

$1.4^\circ$  of kyphosis angle and kyphotic angle was  $16.4$ (SD 2.2).

The mean ODI scores at pre-op period was  $33.71 \pm 3.11$ , at 6 week's post-operative period was  $39.40 \pm 2.73$ , at 3 month's was  $42.67 \pm 2.58$ , at 6 month's was  $45.80 \pm 2.33$  and at 9 month's period, it was  $47.22 \pm 1.69$ . This difference in the mean ODI scores between different time intervals was statistically significant at  $P < 0.001$ .

Table 3: Oswestry scores

Comparison of mean OSWESTRY DISABILITY Score b/w different time intervals using Paired Samples Test Paired Samples Test									
		OSWESTRY DISABILITY Score					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
1.	OSWESTER'S PRE-OP - OSWESTER'S POST-OP	14.650	3.689	.825	12.924	16.376	17.761	19	.000
2.	OSWESTER'S PRE-OP - OSWESTER'S 3 MONTH	19.750	6.172	1.380	16.861	22.639	14.311	19	.000
3.	OSWESTER'S PRE-OP - OSWESTER'S 6 MONTH	23.650	6.393	1.430	20.658	26.642	16.544	19	.000
4.	OSWESTER'S PRE-OP - OSWESTER'S 12 MONTH	27.450	7.612	1.702	23.887	31.013	16.127	19	.000

Two patient developed superficial wound infection which healed by Conservative methods and extended antibiotic therapy. One of our patients developed implant failure. By the time patient came for follow up, bony consolidation seen in the follow up X ray and hence implant exit done.

### Discussion

In the present study, we performed the procedure of one-stage posterior debridement, fixation with pedicle screw, of 40 patients with thoracic and lumbar spinal TB.

In the largest case series followed by Turgut, it was reported that the thoracic segment of the spine was predominantly involved in the study group, consisting of 55% of the study population, followed by the lumbar segment and the cervical segment contributing to 22.8% and 4.2% of the study population respectively [13].

Park *et al.* who reported a predominant involvement of the lumbar segment vertebrae contributing to 44.8 % of the study population followed by the thoracic segment vertebrae and the thoraco-lumbar hinge which contributed 31.3% and 9.7% of the study population respectively [7].

In our study Level of involvement at D10- D11 and L4-L5 level was seen to be the most common in our study and was seen in 16 of the 40 patients (40%).

Ma *et al.* [8] reported that excellent neurological result was observed after single stage posterior debridement, bone graft, and internal fixation in patients with neurological impairment due to spinal TB, which was similar to those obtained via anterior decompression. And the posterior approach may be superior to the anterior instrumentation to correct deformity and maintain that correction

34 (85%) out of 40 patients showed signs of neurological recovery. In the present study, the Frankel scores were significantly higher at the final follow-up visit than those before surgery  $p$ -value = 0.004 ( $<0.05$ ). The results were consistent with Zhang *et al.*'s study [9]. we found that Guven *et al.* [10], Lee *et al.* [5] have reported 100% neurological recovery, sahuo *et al.* [12] reported 94.4% of 18 cases of neurological recovery at final follow-up.

Among 20 patients at final follow-up, Analyzing the fusion rates with posterior-only surgeries, we found that Guven *et al.* [10], Lee *et al.* [5] have reported 100% fusion rates, sahuo *et al.* [12] reported 55% of 18 cases of fusion at final followup.

34 (85%) patients had definitive fusion grade 1 of bridwell score. 5 (10%) patients had probable fusion grade 2 of bridwell score, whereas only 1(5%) patients had probably not fused.

Lee *et al.* [11] found no evidence of solid fusion in any of their cases, but all their patients had excellent pain relief and well

maintained spinal alignment within a follow-up period of 21–40 months. In the present study, definitive fusion was observed in 85% cases, but the patients without fusion and had neither any pain nor any radiologic evidences of implant loosening at their last follow-up and One of our patients developed implant failure. By the time patient came for follow up, bony consolidation seen in the follow up X ray and hence implant exit done.

Average preoperative kyphosis angle was  $22.9^\circ$  (SD 3.2) which could be corrected to an average of  $15.62^\circ$  (SD 2.2) postoperative. At final follow-up, there was a mean loss of  $1.4^\circ$  of kyphosis angle and kyphotic angle was  $16.4$ (SD 2.2)

In the present study, the mean postoperative kyphosis correction was comparable to that of other series in which only posterior surgery was performed (5.16–9.6 degrees) [5, 10, 12].

Functional recovery evaluated in terms of VAS and oswestrys disability index in our study This difference in the mean VAS scores between different time intervals was statistically significant at  $P < 0.05$ . Comparable to that of Sahoo *et al.* [12], Guven *et al.* [10], Lee *et al.* [5]. The majority of the patients were pain-free at final followup.

In a study by Zeng *et al.* [13], The preop ODI scores among the study (69) decreased from  $36 \pm 9$  on average to  $20 \pm 8$  after surgery, with an average score at the final follow-up of  $4 \pm 3$ , similar significant improvement in ODI scores reported by Xu *et al.* [14] in his retrospective study group. in a study by Singh *et al.* [15], The preop ODI scores decreased from 32.52 on average to 13.42 after surgery, with an average score at the final follow-up of 3.96, The ODI scores in our study decreased from 35.85 (19-62) on average prior to surgery to 21.20 (11-42) after surgery, with an average score at the final follow-up of 8.40 (3-41).

### Conclusion

The posterior approach gives a reasonable access to the lateral and anterior aspects of the cord and allows easy access to the spinal canal for neural decompression

It provides better functional outcome and significantly better sagittal plane and kyphosis correction prevents loss of correction of vertebral alignment, and facilitates early mobilisation.

Posterior approach preferred because of its familiarity, low complication rate and avoids problems of prolonged recumbency.

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