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POSTERIOR APPROACH IN SPINAL TUBERCULOSIS: WITH OR WITHOUT CORPECTOMY?

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ABSTRACT

Objective: Spinal tuberculosis is a challenging condition that often requires surgical intervention. The posterior surgical approach has gained popularity due to its technical advantages, yet the necessity of vertebral body resection (corpectomy) remains debated. This study aimed to compare the clinical and radiological outcomes of posterior decompression and spinal fusion surgeries performed with and without corpectomy in patients with spinal tuberculosis.

Materials and Methods: A total of 13 patients were retrospectively analyzed. Group 1 (n=5) underwent posterior decompression and fusion with corpectomy, while Group 2 (n=8) underwent the same procedure without corpectomy. Key variables such as kyphotic angle correction, neurological recovery, operation duration, and hospital stay were compared using appropriate statistical methods.

Results: Group 1 showed significantly better kyphosis correction (33.34% vs. 18.06%, p=0.003) and slightly higher neurological improvement (60% vs. 50%, p=0.171). Operation time was significantly longer in Group 1 (10.6 vs. 4.8 hours, p=0.003). Hospital stay was longer in Group 1 but without statistical significance (19.4 vs. 15.3 days, p=0.435).

Conclusion: Corpectomy via the posterior approach provides significantly better deformity correction but is associated with longer operative time. Surgical decision-making should be tailored to individual clinical and radiological factors.

Keywords: Spinal tuberculosis, posterior approach, corpectomy

INTRODUCTION

Spinal tuberculosis is the most common form of musculoskeletal tuberculosis and predominantly affects the thoracolumbar junction. While medical treatment remains the primary modality, surgical intervention becomes necessary in cases of severe back pain, neurological deficit, progressive kyphotic deformity, spinal instability, or failure of conservative therapy[1-3].

The main objectives of surgery are neural decompression, debridement of infected tissue, correction of spinal alignment, and restoration of mechanical stability. Depending on the location and severity of the disease, surgical approaches can be anterior, posterior, or combined. Although anterior approaches allow direct access for debridement and reconstruction, they are associated with longer operative time, higher blood loss, and potential visceral injury, especially in the thoracic region[4,5]. Recently, the posterior approach has gained prominence due to its lower complication rates, shorter surgical time, effective deformity correction, and ability to achieve stable instrumentation through pedicle screws[6,7]. However, one major question remains controversial: whether decompression and fusion should be performed with or without corpectomy.

Corpectomy allows direct decompression of the spinal canal and correction of kyphosis, but it comes at the cost of longer operative time, greater blood loss, and increased surgical risk[8,9]. Posterior decompression and stabilization without corpectomy, on the other hand, offers a less invasive alternative, but may lead to insufficient deformity correction or implant failure in some cases[10].

In light of these considerations, the present study aims to compare the clinical and radiological outcomes of spinal tuberculosis patients treated via the posterior approach with and without corpectomy. Our goal is to contribute to the evolving literature by providing single-center data and clinical insight into patient selection and technique optimization.

MATERIALS AND METHODS

This study was a retrospective evaluation of 13 patients who underwent surgical treatment for spinal tuberculosis between 2016 and 2024 in our clinic. Demographic data, comorbid diseases, lesion levels, number of diseased vertebrae, pain levels, preoperative kyphosis angles, preoperative neurological function status, types of bone destruction, surgical techniques

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used, operative times, postoperative kyphosis correction rates, neurological recovery levels, intraoperative and postoperative complications, and length of hospital stay were analyzed in detail. The main aim of this study was to compare patients who underwent posterior decompression and fusion with corpectomy versus without corpectomy and to evaluate the clinical and radiological outcomes of these two surgical strategies. The study was approved by the University of Health Sciences Türkiye, Gülhane Training and Research Hospital Non-Interventional Research Ethics Committee (decision number: 2025/9, date: 16.01.2025).

Statistical Analysis

Statistical analyses were performed using IBM SPSS Statistics v25.0. For non-normally distributed numerical variables, group comparisons were conducted using the Mann-Whitney U test. A p-value less than 0.05 was considered statistically significant.

Patients included in the study were those who presented with progressive back pain, radiologically confirmed vertebral destruction, and the need for posterior stabilization due to spinal instability or neurological compromise. All patients underwent detailed preoperative evaluation, including clinical history, laboratory testing, and radiological imaging [magnetic resonance imaging and computed tomography (CT)]. Microbiological confirmation was achieved through sputum acid-fast bacilli testing, polymerase chain reaction (PCR), and/or intraoperative culture and histopathology.

Pre- and postoperative neurological function was assessed using the Frankel classification and Medical Research Council muscle strength scale. Radiological parameters, including local kyphosis angle, were measured using the Cobb method, calculated between the superior endplate of T2 and the inferior endplate of T12.

Bone destruction patterns were classified as fragmentary, subperiosteal, osteolytic, or sclerotic based on CT imaging. Patients were categorized into two groups according to the surgical approach: Group 1 underwent posterior decompression and fusion with corpectomy, while Group 2 underwent posterior decompression and fusion without corpectomy. The clinical and radiological outcomes of both groups were compared.

Inclusion Criteria

Patients were included if spinal tuberculosis was confirmed microbiologically (via culture or PCR from intraoperative specimens), or if there was strong clinical and radiological evidence consistent with spinal tuberculosis in the presence of active pulmonary tuberculosis. All patients had complete medical records and a minimum follow-up duration of 12 months.

Exclusion Criteria

Patients were excluded if no microorganism could be isolated and alternative diagnoses could not be ruled out. Cases with incomplete medical records or insufficient follow-up (<12 months) were also excluded.

Surgical Procedure Without Corpectomy

The indication for this surgical intervention was instability and deformity due to vertebral destruction. As part of the procedure, bilateral transpedicular screw fixation was applied to the involved vertebral levels, and osteotomy was performed on the posterior elements. However, no corpectomy was performed, and only posterior stabilization was achieved (Figure 1).

Preoperative and postoperative radiologic measurements were performed to monitor spinal alignment and kyphotic deformity in the postoperative period. Intraoperative tissue samples were subjected to histopathologic and microbiologic examination.

Surgical Approach in Patients with Corpectomy

This surgical approach is based on the progression of neurologic dysfunction and the presence of severe vertebral deformity and instability. The thoracic spinal surgical procedure was performed with bilateral transpedicular screw fixation at the involved vertebral levels. Prior to the corpectomy procedure, osteotomy was performed on the posterior elements of the involved segment, followed by total corpectomy through a transpedicular approach. For spinal reconstruction, a titanium cage was placed in the defect area. Access was achieved by partial retraction or ligation of nerve roots at involved levels when necessary (Figure 2).

RESULTS

A total of 13 patients were evaluated in this study. Group 1, which included patients who underwent posterior decompression and fusion with corpectomy, consisted of 5 individuals (3 females, 2 males) with a mean age of 60.4 years (range: 46-73). Group 2, in which corpectomy was not performed, included 8 individuals (3 females, 5 males) with a mean age of 60.5 years (range: 44-81). Radiological evaluation revealed three main types of bone destruction across the cohort: fragmentary (n=7), osteolytic (n=3), and subperiosteal (n=3). The most commonly affected spinal levels were T6-T7 and T10-T12. Vertebral involvement most frequently spanned two vertebrae, followed by single- and four-level involvement.

The mean kyphosis correction rate was significantly higher in Group 1 (33.34%) compared to Group 2 (18.06%) (p=0.003). Neurological improvement was observed in 60% of patients in Group 1 and 50% in Group 2; however, the difference was not statistically significant (p=0.171).

The mean operation duration was significantly longer in Group 1 (10.6 hours) than in Group 2 (4.8 hours) (p=0.003). While the average length of hospital stay was greater in Group 1 (19.4 days vs. 15.3 days), this difference did not reach statistical significance (p=0.435).

Screw failure or implant-related complications were observed only in Group 2, affecting one patient (20%). No such complications were seen in Group 1.

Table 1 summarizes the demographic characteristics and patterns of spinal involvement. Table 2 presents the comparative clinical and radiological outcomes between the two surgical groups.

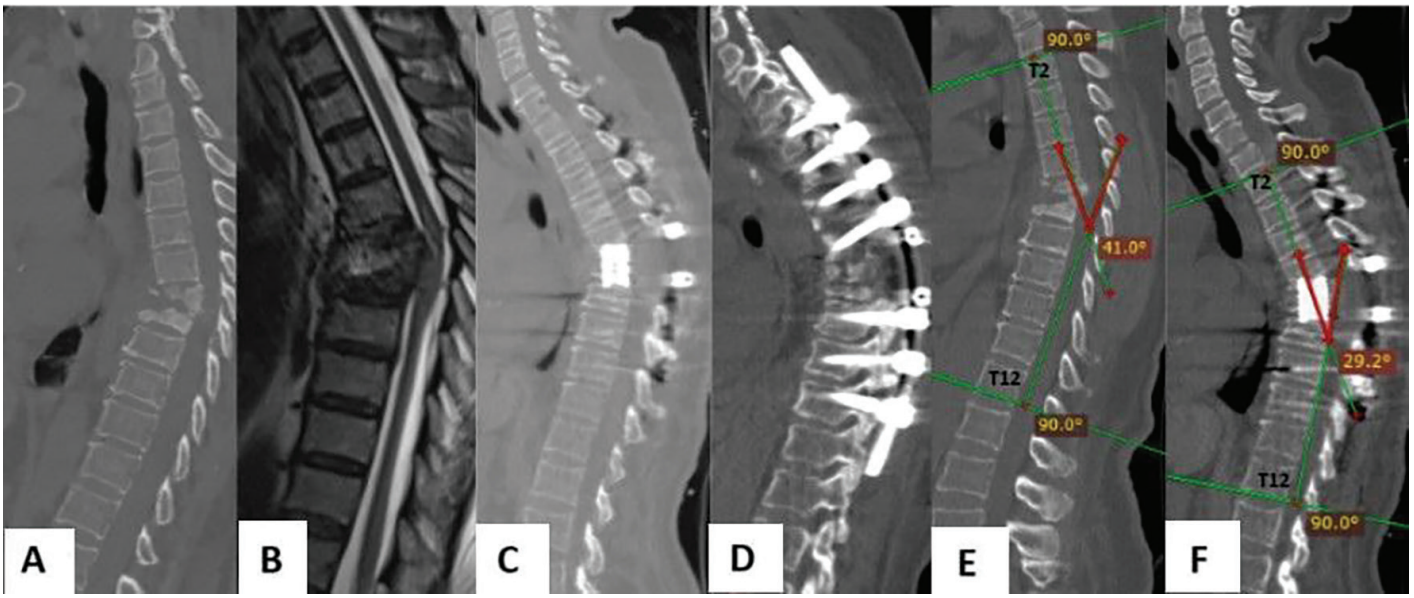

Figure 1. (A) Preoperative MRI scan shows significant spinal cord compression between the T6-T9 levels. (B) A preoperative CT scan shows significant height loss and vertebral destruction of the T6, T7, T8, and T9 vertebrae. (C) Postoperative CT image of transpedicular screw fixation applied during the surgical procedure. (D) An osteotomy procedure was performed on the posterior elements of the T6, T7, T8, and T9 vertebrae. (E) Radiological image of the kyphosis angle measured in the preoperative period. (F) A corrected version of the kyphosis angle measured in the postoperative period. MRI: Magnetic resonance imaging, CT: Computed tomography

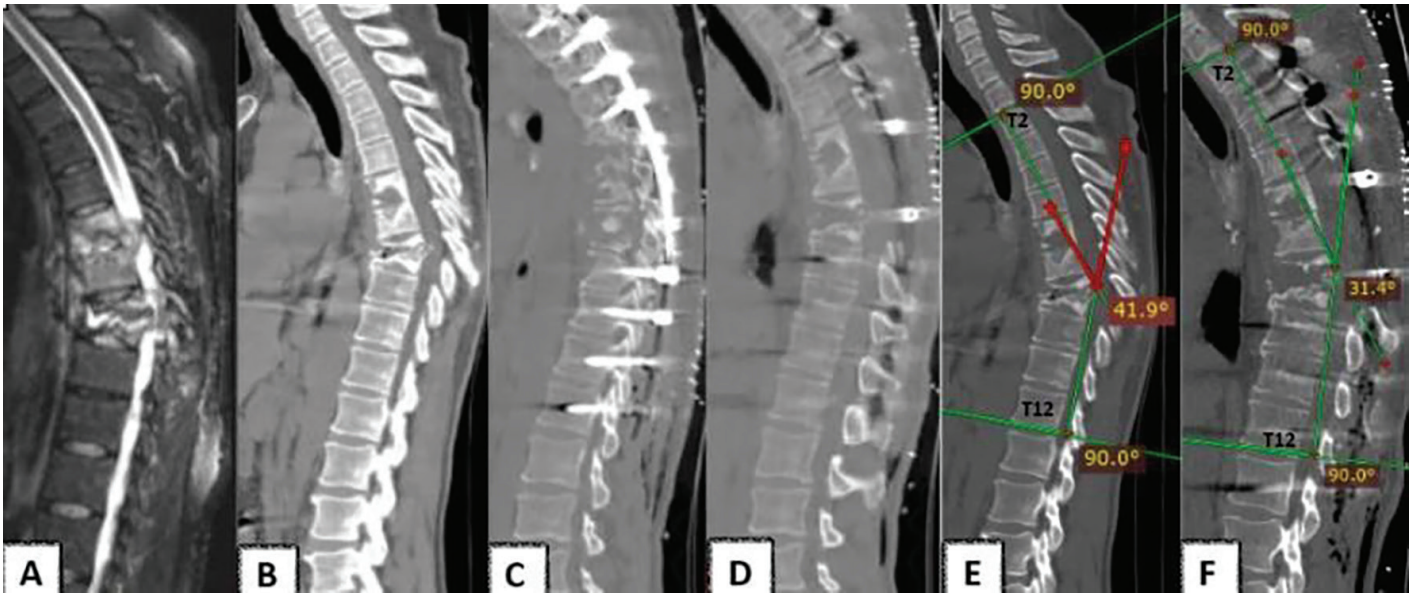

Figure 2. (A) Preoperative CT image shows loss of height and bone destruction at the T6-T7 levels. (B) The fat-suppressed MRI section shows significant spinal cord compression at the T6 level. (C) A titanium cage was placed at the T6 and T7 levels. (D) Bilateral transpedicular screw fixation was applied at the T2-T5 and T8-T10 levels for posterior stabilization. (E) The preoperative kyphosis angle shows the degree of deformity. (F) Postoperative radiologic examination shows improvement in the kyphosis angle. MRI: Magnetic resonance imaging, CT: Computed tomography

Table 1. Demographic characteristics, comorbidities and spinal involvement features of the patients

Group	Patient number	Age	Sex	Other comorbidities	Pathological region	Number of involved vertebrae	Preoperative kyphotic angle	preoperative neurological function	Operation duration (hours)	Postoperative kyphotic angle	Postoperative neurological function	Hospital stay (day)
Group 1	**Patient #1**	69	Female	Diabetes mellitus, hypertension, ovarian cancer	T6-T7	2	41	Frankel B	6	29.2	Frankel C	11
	Patient #2	56	Male	Diabetes mellitus, hypertension	T8-9	2	48.2	Frankel D	8	31.3	Frankel C	13
	Patient #3	46	Female	None	T10-T11-T12	3	52.1	Frankel A	12	37.2	Frankel A	32
	Patient #4	58	Female	Hypertension	T9-T10	2	55.2	Frankel B	13	35.7	Frankel E	24
	Patient #5	73	Male	Diabetes mellitus, hypertension	T11-T12	2	51.2	Frankel B	14	32.2	Frankel D	17
Group 2	**Patient #6**	65	Female	Asthma, hypertension, hypothyroidism	T5-T6-T7-T8	4	44.3	Frankel D	3	37.2	Frankel D	37
	Patient #7	48	Male	Silicosis	T6-T7-T8-T9	4	41.9	Frankel E	5	31.4	Frankel E	20
	Patient #8	72	Male	Hypertension	T11	1	42.2	Frankel C	5	39.2	Frankel C	19
	Patient #9	44	Male	None	T10	1	43.1	Frankel D	4	38.4	Frankel E	15
	Patient #10	63	Male	None	T10-T11	2	44.2	Frankel C	6	36.2	Frankel D	8
	Patient #11	81	Male	Diabetes mellitus, hypertension	T6-T7-T8	2	42.1	Frankel A	7	37.4	Frankel A	12
	Patient #12	42	Female	None	T10	1	46.2	Frankel D	4	31.3	Frankel E	5
	Patient #13	69	Female	Hypertension	T12	1	43.2	Frankel C	5	33.4	Frankel C	7

Table 2. Comparison of clinical and operative outcomes of two surgical approaches

	Surgical approaches		
	Group 1	Group 2	p-value
Kyphosis correction	33.34%	18.06%	0.003
Neurological improvement (Frankel Classification)	60%	50%	0.171
Mean operation duration (hour)	10.6	4.8	0.003
Mean hospital stay (day)	19.4	15.3	0.435
Screw failure or fracture	0%	20%	

DISCUSSION

Early surgical intervention has been shown to support pain control, spinal cord decompression, and functional recovery in selected patients with spinal tuberculosis, particularly when pharmacological treatment alone is insufficient. In our clinical approach, surgical decisions are made based on the severity of spinal cord compression, progressive neurological deficits, deformity, and patient-specific risk factors[11]. In this context, corpectomy with a posterior approach or only posterior decompression and stabilization are decided on a patient-specific basis.

In determining the surgical approach, the segmental extent of the disease, the number of vertebrae involved, the degree of vertebral instability, concomitant systemic diseases, and the patient's general health status are considered. In the literature, many studies are comparing anterior and posterior surgical techniques, and these studies have reported various results in terms of parameters such as intraoperative blood loss, operation time, postoperative complications, hospitalization time, effects on kyphotic deformity, neurological recovery rates, and spinal stability[2,9,12].

Since anterior approaches require a thoracotomy, especially in cases involving the thoracic region, they have been associated with postoperative respiratory complications, delayed mobilization, more extended hospital stays, and often the need for additional posterior stabilization. In contrast, the posterior approach has become a more preferred method by spine surgeons because of its advantages, such as relatively fewer surgical complications and more effective correction of the kyphotic angle[5,6,13].

Consistent with recent large-scale series, posterior-only approaches have shown efficacy comparable to anterior or combined methods in terms of deformity correction and neurological recovery[14]. In our study, Group 1 (posterior + corpectomy) achieved significantly greater kyphosis correction (33.3% vs. 18.1%, p=0.003) with a trend toward better neurological improvement (60% vs. 50%, p=0.171). These results mirror findings by Debnath et al.[15] and others, who reported excellent neurological outcomes ($p<0.0001$) following posterior corpectomy. On the other hand, an implant-related complication-specifically, screw breakage-was observed only in Group 2, which did not undergo corpectomy, and occurred in one out of five patients. Although this corresponds numerically to a 20% rate, the fact that it was observed in a single patient precludes meaningful statistical analysis. Nevertheless, the occurrence of this complication exclusively in the non-corpectomy group may suggest a potential limitation of posterior stabilization techniques when corpectomy is omitted, particularly in cases where long-term structural support is insufficient. Previous studies have reported that in spinal tuberculosis-especially in patients requiring multilevel instrumentation-complete spinal fusion may take as long as two to three years to be achieved. Therefore, longer follow-up periods are essential to more accurately reveal potential differences in outcomes between surgical approaches. Based on our clinical experience and current data, posterior decompression and stabilization without corpectomy appear to provide satisfactory clinical and radiological outcomes in cases of single-level involvement. However, in patients with three or more vertebral segments affected, the increased biomechanical load may necessitate the inclusion of corpectomy to ensure long-term spinal stability. This approach aligns with current literature advocating extended posterior stabilization in the management of multilevel spinal tuberculosis cases[14,15].

In our clinical practice, we have largely moved away from anterior approaches based on our previous experience and have made posterior surgical techniques our primary choice. We prefer the transpedicular approach during posterior surgical procedures, especially in cases requiring corpectomy[16]. During the surgical planning process, the localization of the lesion on the spinal axis, the number of vertebrae involved, the degree of vertebral destruction, the neurological status of the patient, and the accompanying systemic comorbidities are evaluated in detail.

Although human immunodeficiency virus (HIV) infection is considered an important risk factor for the development of spinal tuberculosis, HIV positivity was not detected in any of the patients evaluated in our study[17,18]. Although the literature has reported that the posterior approach gives more successful results in kyphosis correction, neurologic recovery rates are similar in the surgeries performed in our clinic. In addition, the increase in kyphosis deformity after anterior surgery and the resulting need for a second posterior surgery is one of the important factors decreasing the interest in the anterior approach[10,19,20]. In contrast, our patients who underwent corpectomy via the posterior approach did not require a second surgical intervention. In patients who underwent posterior decompression and stabilization without corpectomy, screw failure was observed at a rate described in the literature[21].

In conclusion, the literature still lacks studies examining the relationship between the number of diseased vertebrae and the need for corpectomy. This situation causes decision-making processes in clinical practice to be primarily based

on the surgeon's personal experience and center-based practice protocols. The need for large-sample, multicenter, and randomized controlled clinical trials to obtain more robust evidence continues in this context.

According to our clinical observations and current experience, in cases with single vertebral involvement, satisfactory clinical and radiological results can be achieved with posterior decompression and stabilization procedures performed in addition to anti-tuberculosis pharmacological treatment, often without corpectomy. However, when three or more vertebrae are involved in the disease process, the surgical planning process becomes more complex, resulting in longer operation time and a significantly increased risk of surgical complications.

For these reasons, the necessity of corpectomy in cases with multilevel vertebral involvement is carefully re-evaluated on a patient-by-patient basis, and posterior stabilization and decompression methods are recommended as a priority in our clinical practice to reduce surgical morbidity, optimize operation time, and support the postoperative recovery process.

Study Limitations

This study has several limitations that should be acknowledged. First, the retrospective design inherently limits the ability to control for confounding variables and may introduce selection bias. Second, the sample size was relatively small, which reduces the statistical power and limits the generalizability of the findings. Third, there was a degree of diagnostic heterogeneity among patients, as the diagnosis of spinal tuberculosis was based on a combination of microbiological, radiological, and clinical criteria, which may vary in specificity and sensitivity. In addition, the absence of a non-operative or comparative control group restricts our ability to assess the relative efficacy of surgical versus conservative treatment. Finally, the follow-up period was limited to 12 months, which may not fully capture long-term outcomes such as delayed fusion, implant stability, or recurrence. Despite these limitations, the study provides clinically relevant insights into surgical decision-making in patients with spinal tuberculosis and may serve as a basis for future prospective and multicenter research.

CONCLUSION

Corpectomy can be performed through a posterior approach in spinal tuberculosis surgery, and the clinical outcomes of this method may be more favorable compared to patients who undergo only posterior decompression and fusion surgery. Corpectomy through the posterior approach offers certain advantages but also some disadvantages. Therefore, patient selection should be meticulous, and this method should be preferred in appropriate cases. Considering the available literature, further studies are needed to increase the level of evidence in this field.

Ethics

Ethics Committee Approval: The study was approved by the University of Health Sciences Türkiye, Gülhane Training and Research Hospital Non-Interventional Research Ethics Committee (decision number: 2025/9, date: 16.01.2025).

Informed Consent: Retrospective study.

Footnotes

Authorship Contributions

Surgical and Medical Practices: S.K., M.C.E., M.O.D., Concept: S.K., Design: S.K., A.K., M.C.E., Data Collection or Processing: S.K., A.K., Analysis or Interpretation: S.K., Literature Search: S.K., A.K., Writing: S.K., A.K.

Conflict of Interest: No conflict of interest was declared by the authors.

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