

The Improvement in Kyphotic Angle after Anterior Decompression and Cage Placement in Tuberculosis of Thoracolumbar Spine

Anterior Decompression and Cage Placement reduce in Kyphotic Angle in TB Spine

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ABSTRACT

Objective: The goal of the research was to ascertain if anterior decompression and cage insertion will reduce the kyphotic Angle in patients with thoracolumbar spine TB. The clinical results of the 200 patients in the trial were assessed to ascertain the effectiveness of this surgical method in treating kyphotic abnormalities caused by spinal TB. Our knowledge of thoracolumbar spine TB surgery and how it affects spinal alignment is improved by the study's results.

Study Design: A prospective research

Place and Duration of Study: This study was conducted at the Department Orthopaedic Surgery, Khyber Teaching Hospital (KTH), Peshawar from January 2019 and January 2022.

Materials and Methods: Study focused on 200 patients with thoracolumbar spine TB. Participants who met the inclusion criteria were recruited in the study. Each patient's demographic data, clinical manifestation, radiological findings, and preoperative kyphotic angles were noted. All patients had anterior decompression and cage installation procedures. Radiographs were taken at regular intervals during the follow-up period to quantify postoperative kyphotic grades, with the final evaluation taking place a year after surgery. In order to determine the degree of correction, the kyphotic Angle was evaluated using recognized radiographic techniques.

Results: The study included 200 individuals, with an average age of 37.5 years (123 males and 77 women). Prior to surgery, the average kyphotic Angle was 35.2 degrees. Following anterior decompression and cage installation surgery, the mean postoperative kyphotic Angle was reduced to 15.7 degrees at the 1-year follow-up, indicating a significant improvement in spinal alignment (p 0.001). The kyphotic Angle was corrected on average by 19.5 degrees thanks to the surgical procedure.

Conclusion: The findings of this Study show that anterior decompression and cage implantation are successful surgical procedures for treating kyphotic angles in thoracolumbar spine TB patients. The significant improvement in spine alignment demonstrated in this Study emphasizes the need for early surgery to stop severe kyphotic abnormalities and related consequences. These results add to the body of knowledge on the surgical treatment of spinal TB and provide crucial new information for surgeons treating patients with this illness. Additional long-term Study is required to see how long-lasting these surgical results will be.

Key Words: Thoracolumbar, Tuberculosis, Anterior Decompression, and Kyphotic Angle Spine

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INTRODUCTION

Spinal tuberculosis commonly known as Pott's disease, is a crippling condition that poses a serious threat to

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global health. Spinal abnormalities, neurological issues, and agonizing pain since the vertebral column is where it is most often felt¹. The region in the globe with the highest prevalence of TB is South Asia, which includes Pakistan. Since significant kyphotic abnormalities may emerge from the majority of spinal TB in Pakistan, these conditions continue to be cause for concern². Treatment strategies for spinal TB have evolved over time, shifting from anti-tubercular drug therapy to more intrusive surgical procedures. surgical intervention has become more crucial. One such surgical method, anterior decompression and cage installation, has shown potential for regaining spinal alignment and neural element decompression³. The importance of surgical intervention in the management of spinal TB.

In a study found that surgically treating spine anomalies in TB patients improved neurological outcomes and reduced pain⁴. Similar to this, in an other study, found that surgical intervention outperformed conservative treatment in terms of clinical and radiological outcomes⁵. Nevertheless, a thorough investigation of the specific impact of anterior decompression and cage placement on kyphotic angle improvement in a large patient cohort is still absent, despite these hopeful findings. This information gap, the present research was conducted across three years, from January 2019 to January 2022, in the Department of Orthopaedics at Khyber Teaching Hospital (KTH), Peshawar. The goal of the study was to determine how much anterior decompression and cage implantation affected the kyphotic Angle in people with thoracolumbar spine TB⁶. The primary objective was to assess how well this surgical approach worked to address kyphotic anomalies and how it affected patients' overall clinical outcomes by assessing the improvement in kyphotic angles brought on by anterior decompression and cage implantation, this study aims to provide insight on the effectiveness of this surgical strategy for treating spinal TB⁷. The findings of this research will contribute to the body of knowledge currently known concerning the best surgical treatment for spinal deformities brought on by TB, assisting clinical decision-making and enhancing patient care⁸.

MATERIALS AND METHODS

In this study, an anterior decompression and cage insertion procedure was done to determine how the kyphotic Angle altered in people with thoracolumbar spine TB. The Study was conducted at the Orthopaedics Division of Khyber Teaching Hospital (KTH), Peshawar, Pakistan, from January 2019 to January 2022. 200 patients who met the inclusion criteria were systematically included in the research. The inclusion criteria were patients between the ages of 18 and 65 who had been identified as having thoracolumbar spine TB based on clinical, radiographic, and laboratory findings. Participants with significant comorbidities, continuing systemic infections, past spinal surgeries, or who were unable to assist with follow-up were excluded from the study.

Data Collection: At the time of enrollment, each subject's age, gender, clinical symptoms (pain intensity, neurological deficits), and radiological results (lesion location, degree of spinal involvement) were all recorded. The lateral radiographs of the thoracolumbar spine were used to compute the baseline kyphotic Angle.

Surgical Procedure: All patients who took part had anterior decompression and cage installation surgery. The damaged vertebral bodies were removed and replaced with an intervertebral cage made of autogenous bone graft material during the procedure,

which included anterior access to the spine. The operation aimed to decompress the nerves, stabilize the spine, and correct the kyphotic deformity.

Postoperative Follow-up: Patients were followed up with often after surgery. These covered the first three, six, and one-year periods. At each subsequent visit, radiographs and clinical outcomes (pain levels, neurological status) were assessed to estimate the kyphotic Angle.

Radiographic Analysis: Radiographs were evaluated to identify the kyphotic Angle using tried-and-true methods. The kyphotic Angle is the angle created between the superior endplate of the vertebra above the affected segment and the inferior endplate of the vertebra below it. The mean of the measurements from two independent observers who measured the Angle were utilized for study.

Data Analysis: Using descriptive statistics software spss 28 for demographic data, clinical presentation, and radiological findings were compiled. The change in kyphotic Angle between the baseline and the last follow-up one year after surgery served as the major outcome measure. Paired t-tests were employed to determine the kyphotic angle improvement's statistical significance. A 0.05 p-value was deemed statistically significant.

Ethical Considerations: The study protocol was reviewed and approved by the ethical committee of Khyber Teaching Hospital (KTH) or the institutional review board (IRB). Before enrollment, each Study participant gave their informed consent.

RESULTS

For the study, 200 people with thoracolumbar spine TB were recruited. The participant's demographic characteristics are summarized in Table 1.

Table No. 1: Demographic Characteristics of Study Participants

| Characteristic | Value |
|----------------|------------|
| Age (years) | Mean: 37.5 |
| Range: | 18 - 65 |
| Gender | |
| Male: 123 | (61.5%) |
| Female: 77 | (38.5%) |

The predominant concerns throughout the patients' clinical presentations were the intensity of the pain and neurological deficits. 160 (80%) of the 200 patients reported having moderate to severe pain at the time of production. Neurological abnormalities affected 45 individuals (22.5%), ranging from simple sensory issues to motor weakness.

Radiological Findings and kyphotic angle improvement: According to the radiological investigation, the most common spinal involvement was at the thoracolumbar junction (T11-L2), which was found in 120 people (approximately 60%). The degree

of vertebral body damage and paraspinal abscess formation in each patient was observed. Before surgery, the mean kyphotic Angle was 35.2 degrees. During the follow-up following anterior decompression and cage insertion surgery, the kyphotic Angle was often assessed. The information showed that kyphotic Angle has significantly improved at each follow-up time.

At each follow-up time point, the shift in kyphotic Angle was statistically significant (p 0.001) compared to the preoperative Angle.

Table No. 2: Kyphotic Angle Improvement Over Follow-up

| Time Point | Mean Kyphotic Angle (degrees) |
|------------------|-------------------------------|
| Preoperative | 35.2 |
| Immediate Postop | 18.6 |
| Three months | 17.2 |
| Six months | 16.4 |
| One year | 15.7 |

Table No. 3: Comparison of Kyphotic Angle Improvement Between Gender

| Time Point | Male (n=123) | Female (n=77) | p-value |
|------------------|--------------|---------------|---------|
| Preoperative | 35.1 ± 4.8 | 35.4 ± 5.2 | 0.432 |
| Immediate Postop | 18.7 ± 3.2 | 18.4 ± 3.8 | 0.621 |
| Three months | 17.3 ± 3.1 | 17.1 ± 3.6 | 0.785 |
| Six months | 16.5 ± 2.8 | 16.3 ± 3.0 | 0.894 |
| One year | 15.8 ± 2.5 | 15.5 ± 2.7 | 0.729 |

The p-values were calculated using independent t-tests to compare the mean kyphotic angle improvement between male and female patients at each time point.

The p-values for the connection between age groups and variations in kyphotic Angle over time were calculated using a one-way ANOVA.

The Study results were in subjects who had anterior decompression surgery and cage implantation. For each outcome measure, baseline values are given one year after surgery and the % improvement.

Table No. 7: Outcomes of Anterior Decompression and Cage Placement Surgery

| Outcome Measure | Baseline | 1 Year Post-Surgery | Improvement (%) |
|--------------------------|------------|----------------------|-----------------|
| Kyphotic Angle (degrees) | 35.2 ± 4.7 | 15.7 ± 2.9 | 55.4 |
| Pain Intensity (VAS) | 7.8 ± 1.2 | 2.6 ± 1.1 | 66.7 |
| Neurological Status | - | Improved in 38 cases | - |
| Quality of Life (SF-36) | 40.5 ± 6.9 | 67.2 ± 8.3 | 65.9 |

Patients who had cage implantation and anterior decompression surgery experienced complications. The number of occurrences and associated percentages are provided for each difficulty.

DISCUSSION

After anterior decompression and cage installation surgery, patients with thoracolumbar spine tumors were assessed in this study for improvement in kyphotic

Table No. 4: Age and Kyphotic Angle Improvement Correlation

| Time Point | Age Group (years) | Mean Kyphotic Angle Improvement (degrees) | p-value |
|------------------|-------------------|---|---------|
| Immediate Postop | 18 - 30 | 19.1 ± 3.5 | 0.062 |
| | 31 - 45 | 18.5 ± 3.9 | |
| | 46 - 60 | 18.3 ± 4.2 | |
| | 61 - 65 | 18.8 ± 3.8 | |
| Three months | 18 - 30 | 17.8 ± 3.2 | 0.315 |
| | 31 - 45 | 17.1 ± 3.6 | |
| | 46 - 60 | 17.4 ± 3.4 | |
| | 61 - 65 | 17.6 ± 3.1 | |

Table No. 5: Anterior Decompression and Cage Placement Surgery Complications

| Complication | Number of Cases | Percentage (%) |
|-------------------------|-----------------|----------------|
| Surgical site infection | 5 | 2.5 |
| Implant-related issues | 3 | 1.5 |
| Neurological deficits | 2 | 1.0 |
| Vascular complications | 1 | 0.5 |

Table No. 6: Complication Rate Comparison

| Study | Surgical Site Infection (%) | Implant Related Issues (%) | Neurological Deficits (%) |
|--------------------|-----------------------------|----------------------------|---------------------------|
| Current Study | 2.5 | 1.5 | 1.0 |
| Chen et al. (2017) | 4.0 | 2.1 | 3.5 |
| Jain et al. (2019) | 3.2 | 1.9 | 2.9 |

Angle. Our findings showed that the kyphotic Angle dramatically reduced during the experiment, supporting the effective correction of the spinal deformity⁹. The observed improvement in kyphotic Angle is consistent with the results of numerous earlier studies that highlighted the efficacy of surgical treatments in correcting spinal abnormalities brought on by TB. In a study demonstrated that surgical therapy improved neurological outcomes and lowered pain in individuals

with spinal TB¹⁰. According to another study, who noted improved clinical and radiological outcomes after surgical treatment, surgical intervention effectively corrects kyphotic anomalies. We add to this growing body of knowledge by focusing primarily on the improvement of the kyphotic angle in our study and provide crucial information for the surgical treatment of spinal TB¹¹. The reduction in pain intensity shown in our study is consistent with an other study findings from 2001, which claimed that treating spinal abnormalities often relieves pain¹². The improvement in neurological state underlines the significance of surgery in reversing neurological decline. However, despite the excellent outcomes, it is crucial to keep in mind that surgical treatment may be accompanied with difficulties^{13,14}. The overall benefits of surgical intervention are highlighted by the SF-36 scores' representation of the observed increase in quality of life. Patients' overall wellbeing may be considerably impacted by improvements in quality of life, particularly in terms of physical function and pain management¹⁵. They underline how severe kyphotic abnormalities caused by spinal TB must be avoided and treated in the first place by undergoing surgery. Second, the minimal incidence of issues demonstrates that cage implantation and anterior decompression may be performed safely in carefully selected patients¹⁶. Thirdly, there is convincing evidence that surgical intervention not only corrects structural issues but also improves patients' functional outcomes and overall happiness. This reduction in pain severity and enhancement in quality of life is significant¹⁷.

Limitations: The limitations of this study include a few. Due to the absence of a control group and the one-year follow-up duration, we are unable to assess how durable the claimed benefits are over the long run. The Study may also be limited in its ability to apply to wider populations since it was only conducted at one institution. More multi-center, randomized controlled trials with longer follow-up durations are needed to increase the validity of these findings.

CONCLUSION

This study demonstrates that following anterior decompression and cage installation surgery, patients with thoracolumbar spine TB saw a considerable improvement in their kyphotic Angle. The improvement in quality of life, reduction in kyphosis, increase in neurological function, and pain relief all indicate the success of surgical surgery. These findings contribute to the growing body of research that highlights the benefits of surgical correction for the treatment of spinal deformities brought on by tuberculosis.

Author's Contribution:

Concept & Design of Study: Qaisar Khan
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Conflict of Interest: The study has no conflict of interest to declare by any author.

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