

Clinical Outcomes of Single Posterior Approach in the Management of Thoracolumbar Spine Injuries: Experience from 61 Patients

Md. Ali Ashraf^{1,*} , K. M. Shorfuddin¹ , Md. Abdul Motin¹ ,
Mohd. Mohidul Islam¹ , Rizwan Jamil¹ , Md. Ali Shah¹ , Ashek-E-Mahmud
Chowdhury² , Tahasin Rahman³ 

¹Department of Orthopaedic Surgery, National Institute of Traumatology and Orthopaedic Rehabilitation, Dhaka, Bangladesh.

²National Institute of Traumatology and Orthopaedic Rehabilitation, Dhaka, Bangladesh.

³Department of Pathology, Ibrahim Medical College, Dhaka, Bangladesh.

*Address for correspondence: Dr. Md. Ali Ashraf, Department of Orthopaedic Surgery, National Institute of Traumatology and Orthopaedic Rehabilitation, Dhaka, Bangladesh. E-mail: alishrafndmc@gmail.com

Abstract

Introduction: Thoracolumbar spine injuries account for a large share of cases in people who have experienced high, energy trauma. These injuries commonly bring about severe pain, unstable spine, and nerve damage. Surgery is generally considered necessary to align the spine, decompress the nerves, and enable the patient to get up and move around early. This study aimed at determining the safety and clinical efficacy of using only the posterior approach for the surgical management of thoracolumbar spine injuries.

Methods: This prospective observational study started in January 2023 and will continue until June 2025. It took place at the Department of Spine Surgery of the National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR) and some private hospitals in Dhaka, Bangladesh. A total of 61 consecutive patients with thoracolumbar spine injuries who had surgical treatment with a single posterior approach were enrolled in the study. The data were analyzed using SPSS version 26.0.

Result: Among 61 patients, most were male (82.0%), and their injuries mainly affected the thoracolumbar junction, with L1 being the most common site (42.6%) followed by D12 (18.0%). All the patients had spinal cord injuries, and incomplete injuries were more common, with ASIA, C being the most frequent (39.3%). At the follow, up ($n = 56$), neurological recovery occurred in patients with incomplete injuries, with 70.0% of ASIA, B and 75.0% of ASIA, C upgrading to ASIA, D or E, whereas, no recovery was seen in ASIA, A cases. Functional results were good, with 92.9% of patients reporting substantial pain relief and 96.4% being mobilized early.

Conclusion: This study highlights that the single posterior approach is safe and effective surgical option for thoracolumbar spine injury management. Efficient mechanical stability was achieved through posterior decompression and pedicle screw stabilization, which accounted for the significant pain relief and the facilitation of early mobilization in the majority of patients. Patients with incomplete spinal cord injury, especially ASIA, B and ASIA, C grade cases, showed significant neurological improvement. Meanwhile, no neurological recovery was seen in cases of complete spinal cord injury.

Keywords: Single posterior approach, thoracolumbar spine injuries, immobilization

Introduction

Thoracolumbar fractures are thoracolumbar spine injuries that make up a large percentage of spinal trauma and are a leading cause of disability, especially in young and economically active populations. The thoracolumbar junction (T10L2) is susceptible to injury due to the change from the relatively stiff thoracic spine to the more flexible lumbar segment, which makes it a biomechanically weak area during high, energy impact such as falls from height and car crashes.^[1,2] These injuries can lead to spinal instability, progressive kyphotic deformity, pain, and neurological deficits if not treated properly. The overriding objectives in the treatment of thoracolumbar fractures are to restore spinal stability, adequately decompress the neural elements when necessary, correct deformity, and facilitate early mobilization to prevent complications related to prolonged immobilization.^[3] For most unstable fractures, surgical intervention is usually a consideration along with significant vertebral body collapse, progressive neurological deficit, or marked kyphosis. Anterior, posterior, and combined anterior, posterior surgical techniques have been described, each with its own set of benefits and drawbacks.^[4] In the last 20 years, a poster approach has been widely accepted as the main surgical strategy of the thoracolumbar spine trauma. Posterior pedicle screw fixation enables three, column stabilization, indirect decompression through ligamentotaxis, and deformity correction through a single incision. Furthermore, this approach eliminates the problems seen with anterior thoracic or abdominal exposure, such as pulmonary complications, vascular injury, and longer operation time.^[5,6] Furthermore, continued evolution in pedicle screw instrumentation and surgical techniques has significantly enhanced the biomechanical stability and clinical outcomes of posterior fixation. Several studies and systematic reviews have demonstrated that posterior-only stabilization provides clinical and radiological outcomes comparable to combined anterior-posterior procedures, while offering advantages such as reduced blood loss, shorter operative

duration, and decreased hospital stay.^[7] Short-segment posterior fixation, particularly when including the fractured vertebra, has also been shown to maintain kyphosis correction effectively and preserve more motion segments without compromising stability.^[8] Neurological recovery and functional improvement in patients after posterior stabilization have been consistently reported as good. The posterior, only approach is especially appealing in resource, limited settings where complicated combined procedures may not be possible because of its benefits of pain score improvement, early patient mobilization, and low complication rates.^[2,9] Nevertheless, when considering the influence of the variations in fracture patterns, patient characteristics, and surgical techniques on the outcomes, the need for institution, specific clinical data becomes evident. While there are many comparative studies and meta, analyses, most of them combine heterogeneous patient populations or multiple surgical approaches, resulting in the difficulty of evaluating the effectiveness of a single posterior approach alone. Moreover, data from developing countries are scarce, where differences in the mechanisms of injury, presenting patterns, and the availability of healthcare resources may have an impact on treatment outcomes.^[3,10]

Methods

This prospective observational study was carried out from January 2023 to June 2025 at the Department of Spine Surgery of the National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR) and selected private hospitals in Dhaka, Bangladesh. 61 consecutive patients with thoracolumbar spine injuries who had surgical management through a single posterior approach were included in the study. Patients were enrolled based on clinical and radiological evidence of unstable thoracolumbar fractures with or without neurological deficit and who agreed to surgical treatment and follow, up. A structured data collection form was used to record demographic data, injury characteristics,

neurological status, and operative details. Out of the total study population, 50 patients were male and 11 were female. The distribution of the vertebral levels involved was as follows: D8 (1 patient), D10 (4 patients), D11 (6 patients), D12 (11 patients), L1 (26 patients), L2 (6 patients), L3 (5 patients), and L4 (2 patients). All patients presented with spinal cord injury. The neurological condition of the patients was evaluated preoperative and during follow-up using the American Spinal Injury Association (ASIA) impairment scale, which showed six patients with ASIA, E, nine patients with ASIA, D, 24 patients with ASIA, C, 10 patients with ASIA, B, and 12 patients with ASIA, A (complete spinal cord injury). All patients received posterior decompression and stabilization with pedicle screw instrumentation under general anesthesia. The postoperative care consisted of early mobilization, physiotherapy, and clinical and radiological follow-up regularly to monitor neurological recovery, spinal alignment, and complications. The data were gathered in a prospective manner and underwent analysis by SPSS version 26.0, to determine the clinical outcomes and safety of a single posterior surgical approach in thoracolumbar spine injuries.

Results

Out of 61 patients, 50 (82.0%) were male and 11 (18.0%) were female, indicating a clear male predominance among patients with thoracolumbar spine injuries [Table 1].

The most commonly involved level was L1, affecting 26 patients (42.6%), followed by D12 in 11 patients (18.0%). Other levels included D11 and L2 in 6 patients (9.8%) each, L3 in 5 patients (8.2%), D10 in 4 patients (6.6%), L4 in 2 patients (3.3%), and D8 in 1 patient (1.6%), showing a predominance of injuries at the thoracolumbar junction [Table 2].

All patients had spinal cord injury at presentation. The majority were ASIA-C (24 patients,

39.3%), followed by ASIA-A in 12 patients (19.7%), ASIA-B in 10 patients (16.4%), ASIA-D in 9 patients (14.8%), and ASIA-E in 6 patients (9.8%), indicating that incomplete spinal cord injury was more common than complete injury [Table 3].

Among the patients available for follow-up ($n = 56$), no neurological improvement was observed in the 12 patients with complete spinal cord injury (ASIA-A). Improvement to ASIA-D or E was seen in 7 out of 10 patients (70.0%) with ASIA-B and 18 out of 24 patients (75.0%) with ASIA-C. All patients with preoperative ASIA-D (9 patients) improved to or maintained functional status, and all 6 patients with ASIA-E remained neurologically intact [Table 4].

Table 1: Demographic characteristics of the study population ($n = 61$)

Variable	Frequency	Percentage (%)
Male	50	82.0
Female	11	18.0

Table 2: Distribution of fracture levels ($n = 61$)

Vertebral level	Frequency	Percentage (%)
D8	1	1.6
D10	4	6.6
D11	6	9.8
D12	11	18.0
L1	26	42.6
L2	6	9.8
L3	5	8.2
L4	2	3.3

Table 3: Preoperative neurological status according to ASIA scale ($n = 61$)

ASIA grade	Frequency	Percentage (%)
ASIA-A	12	19.7
ASIA-B	10	16.4
ASIA-C	24	39.3
ASIA-D	9	14.8
ASIA-E	6	9.8

Out of 56 patients who completed follow-up, 52 (92.9%) became pain-free or reported significant pain relief after surgery. Early mobilization was achieved in 54 patients (96.4%), indicating good functional recovery following posterior stabilization [Table 5].

Postoperative complications were observed in a small number of patients. Dural tears occurred in 2 patients (3.3%) during decompression and were managed with primary repair. Implant failure in the form of screw breakage occurred in 2 patients (3.3%), but no revision surgery was required. Pressure sores developed in 2 patients (3.3%), all of whom had complete spinal cord injury (ASIA-A) [Table 6].

Table 4: Postoperative neurological outcome (n = 56*)

Preoperative ASIA	Improved to D/E	No improvement
ASIA-A (12)	0	12
ASIA-B (10)	7	3
ASIA-C (24)	18	6
ASIA-D (9)	9	0
ASIA-E (6)	6	0

*Five patients were lost to follow-up.

Table 5: Functional outcome after surgery (n = 56)

Outcome	Frequency	Percentage (%)
Pain-free or significant pain relief	52	92.9
Early mobilization achieved	54	96.4

Table 6: Postoperative complications (n = 61)

Complication	Frequency	Percentage (%)
Dural tear (repaired)	2	3.3
Implant failure (screw breakage)	2	3.3
Bed sore (ASIA-A patients)	2	3.3
Revision surgery required	0	0

Discussion

Regarding demographic profile and fracture distribution, our study showed a marked male predominance (82.0%) and the highest frequency of fractures at L1 (42.6%), followed by D12 (18.0%). Similar observations were reported by Rajasekaran et al., who noted that thoracolumbar junction injuries, particularly at L1, constitute the majority of traumatic spinal fractures due to biomechanical vulnerability of the transition zone.^[3] Wood et al. also reported that L1 is the most frequently involved vertebral level in thoracolumbar trauma, supporting our fracture distribution pattern.^[1] In terms of neurological status, most patients in our series had incomplete spinal cord injury, with ASIA-C being the most common (39.3%). Postoperatively, neurological improvement was observed in 70.0% of ASIA-B and 75.0% of ASIA-C patients, while no improvement occurred in patients with complete spinal cord injury (ASIA-A). Tan et al. reported that posterior stabilization in thoracolumbar burst fractures resulted in significant neurological improvement primarily in patients with incomplete deficits, whereas recovery in complete injuries was rare.^[7] Similarly, Aly et al. demonstrated that posterior short-segment fixation resulted in neurological improvement in approximately 65–80% of patients with incomplete injury, but minimal recovery in ASIA-A cases.^[8] These findings confirm that neurological recovery following posterior decompression is largely dependent on the completeness of the initial spinal cord injury. Functional outcomes in our study were encouraging, with 92.9% of patients becoming pain-free or experiencing significant pain relief and 96.4% achieving early mobilization. Tian et al., in a systematic review, reported significant postoperative pain reduction and early ambulation following posterior pedicle screw fixation, emphasizing the role of stable fixation in facilitating rehabilitation.^[9] Similarly, Schnake et al. highlighted that posterior instrumentation allows early mobilization and rapid functional recovery, reducing complications associated with prolonged immobilization.^[6]

The complication rate in our series was low, with dural tear in 3.3%, implant failure in 3.3%, and pressure sores in 3.3% of patients, without any need for revision surgery. Vaccaro et al. reported that modern posterior pedicle screw systems are associated with low complication rates and high construct stability in thoracolumbar trauma.^[5] Reinhold et al. also documented low rates of implant failure and surgical complications with posterior-only approaches, supporting the safety profile observed in our study.^[10] The occurrence of pressure sores exclusively in ASIA-A patients in our series is consistent with findings reported by Joaquim and Patel, who noted that complications related to immobilization are more common in patients with complete spinal cord injury.^[2] The overall final outcomes in our study demonstrated that most patients with incomplete spinal cord injury showed neurological improvement, the majority became pain-free, early mobilization was achieved in nearly all cases, and the complication rate remained low. Similar findings have been reported in a recent study by Elkahla et al.,^[11] where posterior-only surgical management of thoracolumbar fractures in 104 patients resulted in neurological improvement in approximately 80% of patients with incomplete deficits, significant functional recovery, and a low overall complication rate.

Limitations of the Study

The study was conducted in a single hospital with a small sample size. So, the results may not represent the whole community.

Conclusion

The present study demonstrates that the single posterior approach is a safe and effective surgical option for the management of thoracolumbar spine injuries. Posterior decompression and pedicle screw stabilization provided excellent mechanical stability, resulting in significant pain relief and early mobilization in the majority of

patients. Meaningful neurological improvement was observed in patients with incomplete spinal cord injury, particularly those with ASIA-B and ASIA-C grades, whereas no neurological recovery occurred in cases of complete spinal cord injury. The procedure was associated with a low complication rate, and most complications were manageable without the need for revision surgery.

Recommendation

Based on the findings of this study, the single posterior approach may be recommended as a primary surgical option for the management of unstable thoracolumbar spine injuries due to its effectiveness in achieving spinal stability, facilitating early mobilization, and promoting neurological recovery in patients with incomplete spinal cord injury. Early surgical intervention followed by structured rehabilitation should be encouraged to optimize functional outcomes.

References

1. Wood KB, Li W, Lebl DR, Ploumis A. Management of thoracolumbar spine fractures. *Spine J* 2014 Jan; 14(1):145–64.
2. Joaquim AF, Patel AA. Thoracolumbar spine trauma: Evaluation and surgical decision-making. *J Craniovertebr Junction Spine* 2013 Jan 1;4(1):3–9.
3. Rajasekaran S, Kanna RM, Shetty AP. Management of thoracolumbar spine trauma: An overview. *Indian J Orthop* 2015 Feb;49(1):72–82.
4. Verlaan JJ, Diekerhof CH, Buskens E, Van der Tweel I, Verbout AJ, Dhert WJ, et al. Surgical treatment of traumatic fractures of the thoracic and lumbar spine: a systematic review of the literature on techniques, complications, and outcome. *Spine* 2004 Apr 1;29(7):803–14.
5. Vaccaro AR, Oner C, Kepler CK, Dvorak M, Schnake K, Bellabarba C, et al. AOSpine thoracolumbar spine injury classification system: fracture description, neurological status, and key modifiers. *Spine* 2013 Nov 1;38(23):2028–37.
6. Schnake KJ, Stavridis SI, Kandziora F. Five-year clinical and radiological results of combined anteroposterior

- stabilization of thoracolumbar fractures. *J Neurosurg Spine* 2014 May 1;20(5):497–504.
7. Tan T, Donohoe TJ, Huang MS, Rutges J, Marion T, Mathew J, et al. Does combined anterior-posterior approach improve outcomes compared with posterioronly approach in traumatic thoracolumbar burst fractures?: a systematic review. *Asian Spine J* 2020 Jan 8;14(3):388.
 8. Aly TA. Short segment versus long segment pedicle screws fixation in management of thoracolumbar burst fractures: meta-analysis. *Asian Spine J* 2017 Feb 17;11(1):150.
 9. Tian F, Tu LY, Gu WF, Zhang EF, Wang ZB, Chu G, et al. Percutaneous versus open pedicle screw instrumentation in treatment of thoracic and lumbar spine fractures: A systematic review and meta-analysis. *Medicine*. 2018 Oct 1;97(41):e12535.
 10. Reinhold M, Knop C, Beisse R, Audigé L, Kandziora F, Pizanis A, et al. Operative treatment of traumatic fractures of the thoracic and lumbar spinal column: part III: follow up data. *Unfallchirurg* 2009 Mar 1;112(3):294–316.
 11. Elkahla G, Trifa A, Darmoul M. The validity of posterior approach in thoracolumbar spine fracture surgery: A study of 104 cases with literature review. *J Craniovertebr Junction Spine* 2025 Apr 1;16(2):212–7.

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