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ORIGINAL ARTICLE

OUTCOME OF CONSERVATIVE MANAGEMENT OF DORSOLUMBAR SPINE FRACTURES WITH THORACOLUMBAR INJURY CLASSIFICATION AND SEVERITY SCORE FOUR IN TERMS OF NEUROLOGY, KYPHOTIC ANGULATION AND PAIN

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ABSTRACT

Background: Dorsolumbar fractures at the thoracolumbar junction (T11-L2) present therapeutic uncertainty when classified as Thoracolumbar Injury Classification and Severity Score (TLICS) 4. This prospective study evaluated the efficacy of conservative management in this injury category.

Materials & Methods: This prospective study was conducted in the department of Neurosurgery, Lady Reading Hospital, Peshawar from August 2024 to March 2025. Eighty-five patients (aged 18-45 years) with acute single-level dorsolumbar fractures (TLICS 4) were managed non-operatively using thoracolumbosacral orthosis (TLSO) immobilization for three weeks, followed by graded mobilization. Primary outcomes assessed at 12 weeks included neurological status (Medical Research Council scale), kyphotic angulation (Cobb angle >3° = significant change), and pain intensity (Visual Analog Scale; <4 = clinically significant improvement). Chi-square tests were applied using SPSS version 23.

Results: There was total 85 patients, comprising 61.2% males (n=52) and 38.8% females (n=33). Neurological recovery was observed in 67.1% of patients (n=57) achieving grade 5 muscle power, compared to 31.8% (n=27) at baseline. Pain reduction was substantial, with 62.4% (n=53) reporting mild pain versus 2.4% (n=2) initially. Kyphotic angulation remained stable in 56.5% (n=48), with only 2.4% (n=2) exhibiting progression exceeding 7°. Gender significantly influenced pain reduction (p=0.043) and neurological improvement (p=0.024), while trauma mechanism and injury level showed no significant associations.

Conclusions: Conservative management resulted in functional recovery in TLICS 4 fractures, with significant neurological improvement, pain reduction, and kyphotic stability. Gender-based outcome differences require further investigation. These findings support non-operative treatment as a primary strategy in appropriately selected patients.

KEY WORDS: Back Injuries; Cohort Studies; Kyphosis; Neurologic Recovery; Orthotic Devices; Pain Measurement; Spinal Fractures; Thoracolumbar Spine.

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INTRODUCTION

Spinal trauma remains a significant global contributor to morbidity, with dorsolumbar fractures representing a common injury pattern. The thoracolumbar junction (T11-L2 vertebrae) is biomechanically vulnerable due to its transitional position between the rigid thoracic and flexible lumbar spine. Epidemiologically, dorsolumbar fractures account for nearly half of all spinal injuries, with an estimated

15,000 cases reported annually in the United States alone.[1] These injuries commonly result from motor vehicle collisions, falls from height, and sports-related trauma, and disproportionately affect young males-typically in their second to fourth decades-resulting in considerable personal, economic, and societal burden. Dorsolumbar fractures encompass a spectrum ranging from isolated compression injuries to complex burst fractures, with or without neurological compromise. Long-term complications include kyphotic deformity, chronic pain, and persistent neurological deficits. [2] Approximately 25% of patients experience permanent neurological impairment, significantly affecting quality of life. Fracture-induced kyphotic angulation may lead to mechanical back pain, postural imbalance, and neurological deterioration, underscoring the importance of appropriate therapeutic strategies.

Clinical decision-making is guided by fracture morphology, spinal stability, neurological status, and patient-specific factors. The Thoracolumbar Injury Classification and Severity Score (TLICS) provide a standardized framework for evaluating these injuries, incorporating three parameters: fracture morphology, posterior ligamentous complex integrity, and neurological status.[3] TLICS scores ≤3 typically indicate conservative management, while scores ≥5 support surgical intervention. However, a TLICS score of 4 represents a therapeutic gray zone, necessitating individualized clinical judgment. [4] Existing literature presents conflicting evidence regarding the optimal management of TLICS 4 injuries. [5] Surgical intervention offers immediate stabilization but carries procedural risks, whereas conservative treatment may provide a cost-effective alternative in appropriately selected patients. However, knowledge gaps persist regarding the efficacy of non-operative management in achieving neurological recovery, preventing kyphotic deformity, and alleviating pain in this intermediate-risk cohort.

Therefore, the present study aimed to objectively evaluate the outcomes of conservative management in patients with dorsolumbar fractures and a TLICS score of 4, specifically assessing neurological recovery, kyphotic angulation, and pain improvement.

MATERIALS AND METHODS

This prospective case series was conducted at the Department of Neurosurgery, Lady Reading Hospital, Peshawar, Pakistan, tertiary care center for spinal trauma from August 2024 to March 2025. Ethical approval was obtained from the Institutional Ethical Review Committee (Reference number: 901/LRH/MTI). The study evaluated conservative management outcomes over an eight-month period. Participants included adults aged 18-45 years with acute, single-level dorsolumbar fractures (D11-L2 vertebrae) confirmed by computed tomography and classified as Thoracolumbar Injury Classification and Severity Score (TLICS) 4. All patients presented within 24 hours of injury. Exclusion criteria included pathological fractures (metastatic or infectious), osteoporotic or multilevel vertebral fractures, prior spinal surgery, delayed presentation beyond 24 hours, contraindications to conservative treatment, and anticipated non-compliance with follow-up.

Sample size was calculated using the World Health Organization sample size calculator, with a 95% confidence level, 5% margin of error, and an anticipated pain improvement frequency of 31%, yielding a minimum requirement of 85 patients. Participants were enrolled through non-probability consecutive sampling. All patients received standardized conservative management. The immobilization phase involved bed rest with thoracolumbosacral orthosis (TLSO) in an extended position for three weeks, followed by a mobilization phase with supervised graded mobilization and activity restrictions for 8-12 weeks.[6-8]

Primary outcomes were assessed at 12 weeks by blinded independent evaluators. Neurological status was evaluated using the Medical Research Council (MRC) scale (0-5 grading system).[9] Kyphotic angulation was measured using Cobb angle on standing lateral radiographs, with changes exceeding 3° considered significant.[10] Pain intensity was recorded using the Visual Analog Scale (VAS, 0-10), with scores below 4 indicating clinically significant improvement. Baseline parameters included demographic variables, injury mechanism, fracture level, and TLICS components assessed via computed tomography and magnetic resonance imaging. Data analysis was performed using IBM SPSS Statistics version 23. Continuous variables (e.g., age, VAS scores, Cobb angles) were reported as means with standard deviations. Categorical variables (e.g., gender, trauma mechanism) were presented as frequencies and percentages. Associations between outcomes and clinical variables were evaluated using chi-square tests, with p-values <0.05 considered statistically significant.

RESULTS

A total of 85 patients were included, comprising 61.2% males (n=52) and 38.8% females (n=33). The majority of participants (49.4%) were aged between 26 and 35 years, indicating that dorsolumbar spine fractures predominantly affected individuals in their most active working years. Road traffic accidents (47.1%, n=40) and falls (38.8%, n=33) were the predominant injury mechanisms. Fracture distribution across vertebral levels revealed L1 as the most frequently involved (45.9%, n=39), followed by D12 (24.7%, n=21), L2 (17.6%, n=15), and D11 (11.8%, n=10) Table-1.

Table 1: Baseline Characteristics

Variable	Category	Frequency	%age
Gender	Male	52	61.2
	Female	33	38.8
Age	18-25	18	21.2
	26-30	24	28.2
	31-35	20	23.5
	36-40	14	16.5
	41-45	9	10.6
Trauma Mechanism	Road Traffic Accident	40	47.1
	Fall	33	38.8
	Assault	9	10.6
	Sports Injury	3	3.5
Injury Level	L1	39	45.9
	D12	21	24.7
	L2	15	17.6
	D11	10	11.8

Pain progression demonstrated significant improvement. Severe pain decreased from 42.4% (n=36) at baseline to 3.5% (n=3) at 12-week follow-up, while mild pain increased from 2.4% (n=2) to 62.4% (n=53). Neurological recovery, measured by the Medical Research Council (MRC) scale, showed notable enhancement. Patients achieving grade 5 muscle power increased from 31.8% (n=27) to 67.1% (n=57), whereas those with grade 3 impairment decreased from 17.6% (n=15) to 8.2% (n=7). Kyphotic angulation remained stable in most patients. A total of 56.5% (n=48) showed less than 3° Cobb angle change, and only 2.4% (n=2) exhibited progression exceeding 7°.

Table 2: Outcome Measures at Baseline and Follow-up

Parameter	Category	Baseline (n=85)	Follow-up (n=85)
Pain Severity (VAS)	Mild	2 (2.4%)	53 (62.4%)
	Moderate	47 (55.3%)	29 (34.1%)
	Severe	36 (42.4%)	3 (3.5%)
Neurology (MRC Scale)	Grade 3	15 (17.6%)	7 (8.2%)
	Grade 4	43 (50.6%)	21 (24.7%)
	Grade 5	27 (31.8%)	57 (67.1%)
Kyphotic Angulation	<3° change	-	48 (56.5%)
	3.1-7° change	-	37 (43.5%)
	>7° change	-	2 (2.4%)

Gender significantly influenced follow-up pain reduction (Likelihood Ratio: p=0.043) and neurological recovery (Likelihood Ratio: p=0.024). Trauma mechanism demonstrated association with baseline neurological status (Likelihood Ratio: p=0.022) but not with follow-up outcomes. Injury level showed no significant correlations with any outcome measures (p>0.05 for all comparisons).

Table 3: Significant Statistical Associations

Predictor	Outcome	Test	p-value
Gender	Pain at follow-up	Likelihood Ratio	0.043
Gender	Neurology at follow-up	Likelihood Ratio	0.024
Trauma Mode	Neurology at presentation	Likelihood Ratio	0.022

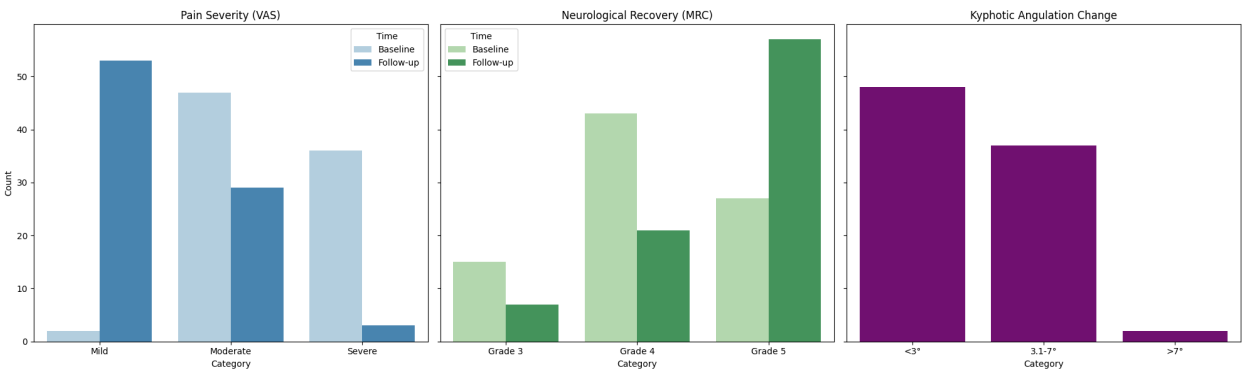

Fig 1: Comparative Analysis of Pain Severity, Neurological Recovery, and Kyphotic Angulation in Clinical Assessment

DISCUSSION

This prospective case series highlights three principal observations: meaningful neurological improvement, substantial symptomatic relief, and preservation of kyphotic alignment following conservative treatment. The degree of neurological recovery seen in our cohort exceeds the modest late recovery rates reported in several older conservative series-some of which documented only 8-12% recovery beyond six months-while other contemporary conservative cohorts report comparable functional gains, supporting the notion that selected patients may regain function without operative intervention.[11-13] Notably, our findings align with studies that emphasize careful patient selection (neurological status, PLC integrity) as a determinant of favorable non-operative neurologic outcomes.[14]

Symptomatic improvement after TLSO immobilization and structured mobilization mirrors results from prior non-operative series, which attribute pain reduction to mechanical stabilization, soft-tissue healing, and early graded rehabilitation rather than direct neural decompression.[12,13,15] This concordance reinforces the role of conservative protocols for symptomatic control in appropriately selected patients. Radiographic stability in our cohort is consistent with established thresholds used to define clinically relevant kyphotic progression, and corroborates literature showing that when the posterior ligamentous complex is preserved, non-operative management commonly maintains sagittal alignment and prevents clinically important deformity.[16]

The observed sex-based differences in recovery are consistent with emerging reports of sex-specific outcome variation after spinal trauma; proposed explanations include biological, hormonal, and biomechanical factors as well as differences in pain perception and healthcare-seeking behavior, but the evidence remains preliminary and warrants further focused study.[17]

We found that trauma mechanism correlated with initial injury severity but did not predict final outcomes, a pattern reported elsewhere and suggesting that mechanism may influence presenting deficit more than eventual recovery when management is appropriate.[14] From a pragmatic perspective, our results support prior cost-effectiveness analyses that favor non-operative pathways in selected TLICS 4 patients, given lower immediate resource utilization and avoidance of surgical morbidity-provided that careful radiographic and clinical selection criteria are applied.[5,17-19]

This prospective, single-center cohort provides focused, protocolized data on a narrowly defined and clinically important group (patients with dorsolumbar fractures and TLICS = 4). The study's standardized conservative protocol (TLSO followed by graded mobilization) and objective outcome measures (MRC, Cobb angle, VAS) strengthen internal validity and deliver pragmatic evidence relevant to resource-limited settings. Limitations include a short (12-week) follow-up that prevents assessment of delayed kyphotic progression and chronic pain; the single-center, non-randomized design and absence of a contemporaneous surgical control arm, which limit generalizability and causal inference; and potential selection bias, lack of blinded outcome assessment, unmeasured brace compliance, and limited adjustment for confounders. These constraints mirror those of similar single-center conservative cohorts, and larger multicenter comparative studies with extended follow-up and formal health-economic analyses are required to validate and refine patient-selection algorithms.[20-22]

CONCLUSION

This study substantiated the clinical efficacy of conservative management for dorsolumbar spine fractures with a Thoracolumbar Injury Classification and Severity Score (TLICS) of 4. At 12-week follow-up, significant functional recovery was observed, including neurological improvement, pain reduction, and kyphotic stability. The findings validate non-operative management as a primary strategy for TLICS 4 injuries, offering evidence-based guidance for clinical decision-making in this therapeutic gray zone. Rigorous immobilization protocols and supervised mobilization achieved substantial functional restoration without surgical intervention. Further multicenter studies are recommended to confirm these outcomes and refine rehabilitation protocols.

REFERENCES

1. Mustafa B. The impact of spine pathology on posterior ligamentous complex structure and function. Curr Rev Musculoskelet Med. 2023;16(12):616-26. https://doi.org/10.1007/s12178-023-09834-6
2. Gnanenthiran SR, Adie S, Harris IA. Non-operative versus operative treatment for thoracolumbar burst fractures without neurologic deficit: a meta-analysis. Clin Orthop Relat Res. 2012;470(2):567-77. https://doi.org/10.1007/s11999-011-2157-7
3. 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 (Phila Pa 1976). 2013;38(23):2028-37. https://doi.org/10.1097/BRS.0b013e3182a8a38
4. Khil EK, Choi I, Lee KY, Kim YW. Can conservative treatment be effective for thoracolumbar injuries patients with TLICS scores of 4 or 5? BMC Musculoskelet Disord. 2024;25(1):431. https://doi.org/10.1186/s12891-024-07324-6
5. Nau C, Pape HC, Jug M, Wendt K, Komadina R, Bloemers F. Thoracolumbar injuries: non-operative treatment: indications, management. Eur J Trauma Emerg Surg. 2024;50(5):1951-7. https://doi.org/10.1007/s00068-024-02619-3
6. Li T, Yan J, Liu X, Hu J, Wang F. Efficacy and safety of conservative treatment compared with surgical treatment for thoracolumbar fracture with score

4 TLICS. Clin Spine Surg. 2024;37(5):230-41. https://doi.org/10.1097/BSD.0000000000001503

7. Celebi L, Muratli HH, Dogan O, Yagmurlu MF, Aktekin CN, Tabak AY, et al. The efficacy of non-operative treatment of burst fractures of the thoracolumbar vertebra. Acta Orthop Traumatol Turc. 2015;49(1):84-91. https://doi.org/10.5152/aott.2015.14.319
8. Wood KB, Li W, Lebl DR, Ploumis A. Management of thoracolumbar spine fractures. Spine J. 2014;14(1):145-64. https://doi.org/10.1016/j.spinee.2012.10.041
9. Furlan JC, Noonan V, Cadotte DW, Fehlings MG. Timing of decompressive surgery of spinal cord after traumatic spinal cord injury. J Neurotrauma. 2011;28(8):1371-99. https://doi.org/10.1089/neu.2009.1147
10. Sadiqi S, Verlaan JJ, Lehr AM, Chapman JR, Dvorak MF, Kandziora F, et al. Measurement of kyphosis and vertebral body height loss in traumatic spine fractures. Eur Spine J. 2017;26(5):1483-91. https://doi.org/10.1007/s00586-016-4716-9
11. Goh TS, Shin JK, Youn MS, Lee HS, Kim TH, Lee JS. Surgical versus nonsurgical treatment of lumbar degenerative kyphosis. Eur Spine J. 2017;26(8):2153-9. https://doi.org/10.1007/s00586-017-5008-8
12. Guarnieri G, Izzo R, Muto M. The role of emergency radiology in spinal trauma. Br J Radiol. 2016;89(1061):20150833. https://doi.org/10.1259/bjr.20150833
13. Karaali E, Çiloğlu O, Duramaz A, Özkan AK, Ekiz T. Management of TLICS=4 thoracolumbar vertebra fractures: surgery versus conservative treatment. Ulus Travma Acil Cerrahi Derg. 2020;26(5):805-10. https://doi.org/10.14744/tjtes.2020.30524
14. Qadir I, Riew KD, Alam SR, Akram R, Waqas M, Aziz A. Timing of surgery in thoracolumbar spine injury: impact on neurological outcome. Glob Spine J. 2020;10(7):877-86. https://doi.org/10.1177/2192568219876258
15. Rampersaud YR, Power JD, Perruccio AV, Paterson JM, Veillette C, Coyte PC, et al. Healthcare utilization and costs for spinal conditions in Ontario. Spine J. 2020;20(6):874-81. https://doi.org/10.1016/j.spinee.2020.01.013
16. Rajasekaran S, Kanna RM, Schroeder GD, Oner FC, Vialle L, Chapman J, et al. Does the spine surgeon's experience affect fracture classification and treatment plan? Glob Spine J. 2017;7(4):309-16. https://doi.org/10.1177/2192568217699209
17. Sidon E, Stein M, Ramalingam G, Shemesh S, Benharroch D, Ohana N. Gender differences in spinal injuries: causes and location. J Womens Health (Larchmt). 2018;27(7):946-51. https://doi.org/10.1089/jwh.2017.6687
18. Gill JS, Stippler M, Ruan Q, Hussain N, White AP, Oruhurhu V, et al. Validation of TLICS in osteoporotic vertebral compression fractures. Interv Pain Med. 2024;3(3):100438. https://doi.org/10.1016/j.inpm.2024.100438
19. Kim DH, Vaccaro AR, Chapman JR, et al. Indications for nonsurgical treatment of thoracolumbar spine fractures: WFNS Spine Committee recommendations. Neurospine. 2021;18(4):704-12. https://doi.org/10.14245/ns.2142346.173
20. Wendt K, Nau C, Jug M, Pape HC, Kdolsky R, Thomas S, et al. ESTES recommendation on thoracolumbar spine fractures. Eur J Trauma Emerg Surg. 2024;50(4):1261-75. https://doi.org/10.1007/s00068-024-02584-x
21. Loughenbury PR, Tsirikos AI. Indications and principles of conservative treatment in vertebral injuries. Orthop Trauma. 2020;34(5):291-7. https://doi.org/10.1016/j.mporth.2020.07.004
22. Zhou Y, Wang Y, Zhang H, Sun Z, Li C. The neurologically intact patient with TLICS 4 or 5 burst fractures: is conservative management safe? Medicine (Baltimore). 2024;103(45):e38316. https://doi.org/10.1097/MD.0000000000038316

CONFLICT OF INTEREST
Authors declare no conflict of interest.
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AUTHORS' CONTRIBUTION

The following authors have made substantial contributions to the manuscript as under:

Conception or Design:	MA, ZUR
Acquisition, Analysis or Interpretation of Data:	MA, ZUR, SSS, MSK, AK, SJA
Manuscript Writing & Approval:	MA, ZUR, SSS, MSK, AK, SJA

All the authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.