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Original Research Article

Management of Thoracolumbar Fractures: Current Treatment Paradigms

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Abstract:

Background: The thoracolumbar junction (T10 to L2) represents a biomechanical transition zone vulnerable to high-energy injuries. Management of fractures in this region remains controversial, balancing non-operative treatment against surgical stabilization.

Objectives: This review updates clinical algorithms for thoracolumbar fractures using the Thoracolumbar Injury Classification and Severity Score (TLICS) to guide therapeutic decision-making.

Methods: Synthesized protocol evaluation highlighting mechanical stability assessment, neurological implications, and current surgical trends.

Results: Minor or stable compression fractures without neurological deficits yield excellent outcomes with functional bracing. Unstable burst injuries, distraction injuries, and fracture-dislocations necessitate rigid surgical fixation to restore spinal alignment, maximize neurological recovery, and facilitate early mobilization.

Conclusion: Validated scoring systems provide a reliable framework for treating thoracolumbar trauma, matching injury morphology to targeted interventions.

Keywords: Thoracolumbar Fracture, Spine Trauma, Burst Fracture, TLICS, Spinal Stabilization.

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Introduction

The thoracolumbar spine, extending from T10 to L2, is the most common site of spinal column injuries [1]. This area represents a biomechanical transition zone where the rigid, kyphotic thoracic spine (stabilized by the rib cage) meets the mobile, lordotic lumbar spine. This structural transition makes the junction highly vulnerable to stress accumulation during high-energy trauma, such as motor vehicle accidents or falls from heights [2].

Managing thoracolumbar fractures requires balancing the restoration of mechanical stability with the preservation of neurological function. While simple fractures can be safely managed conservatively, complex mechanical or neurological collapses demand swift surgical stabilization [3]. This review highlights modern classification systems, diagnostic pathways, and targeted treatment matrices.

Classification and Mechanical Assessment: Standardizing treatment requires a reproducible assessment of spinal column stability. Modern clinical practice has largely transitioned from Denis's classic three-column model to the Thoracolumbar Injury Classification and Severity Score (TLICS) [1, 4].

The TLICS system evaluates three core, independent features:

1. **Injury Morphology:** Categorized into compression, burst, translation/rotation, or distraction mechanics.
2. **Posterior Ligamentous Complex (PLC) Integrity:** Evaluated as intact, indeterminate, or disrupted. The PLC (comprising the supraspinous ligament, interspinous ligament, ligamentum flavum, and facet capsules) acts as the primary tension band preventing progressive kyphosis [2].
3. **Neurological Status:** Documented as intact, nerve root injury, complete spinal cord injury, incomplete spinal cord injury, or cauda equina syndrome.

TLICS Score Cumulative Total	Recommended Management Strategy
$\le$ 3 Points	Non-operative management (bracing, early mobilization).
4 Points	Equivocal; choice left to surgeon discretion based on patient comorbidities and local characteristics.
$\ge$ 5 Points	Surgical intervention (decompression and/or instrumentation).

Diagnostic Radiography: Accurate triage relies on a comprehensive imaging protocol [3].

- **Computed Tomography (CT):** The gold standard for characterizing bony architecture, quantifying vertebral body height loss, measuring canal compromise from retropulsed bone fragments, and identifying lamina fractures [1].
- **Magnetic Resonance Imaging (MRI):** Indispensable for evaluating soft tissue injuries, checking the integrity of the PLC (evident via hyperintense signaling on T2-weighted or STIR sequences), and determining the extent of spinal cord edema or hematomyelia [2, 4].

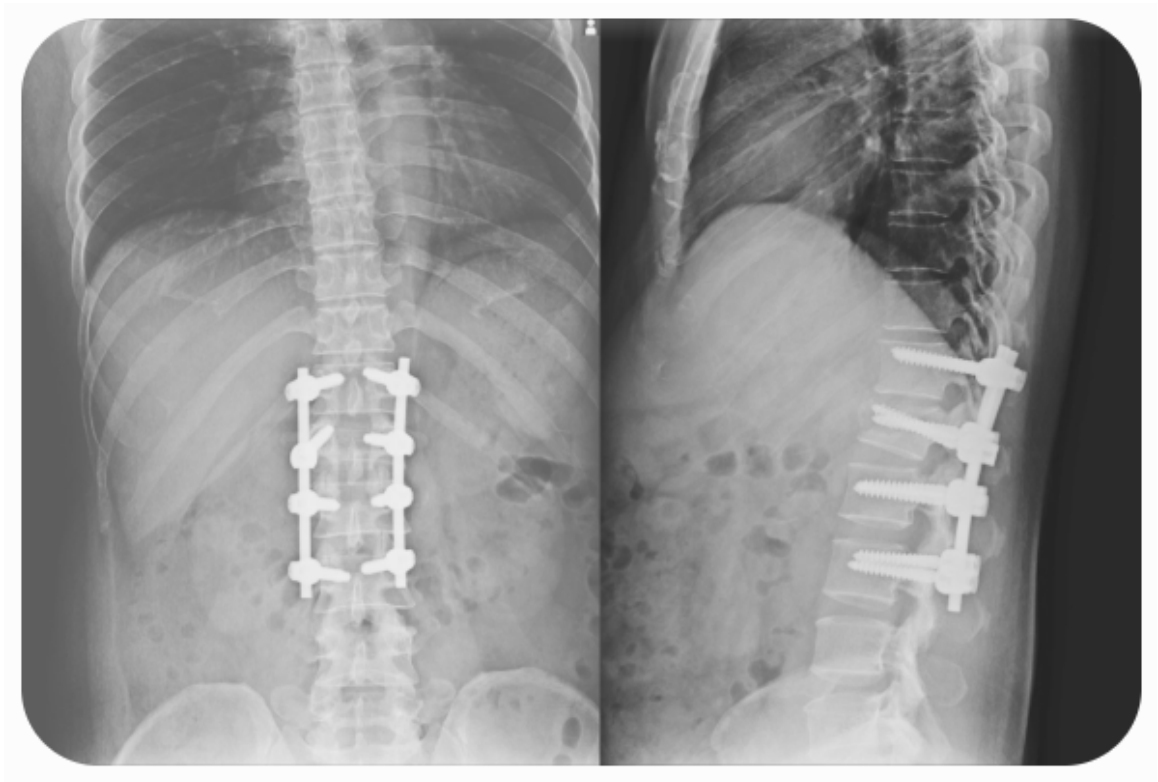
Therapeutic Paradigms

Non-Operative Protocols: Conservative management is appropriate for stable injuries ($\text{TLICS} \le 3$), such as minor wedge compression or stable burst fractures with an intact PLC and no neurological deficits [1]. Treatment involves:

- A custom-molded thoracolumbar orthosis (TLSO) worn during upright activities for 8 to 12 weeks.
- Serial plain radiographs at 1, 2, and 6 weeks to monitor for progressive structural collapse or post-traumatic kyphosis.
- Early functional mobilization to mitigate the risks of prolonged recumbency [3].

Surgical Intervention

Surgical stabilization is indicated for unstable burst fractures, distraction injuries, fracture-dislocations, or any fracture presenting with a neurological deficit (TLICS more or equal 5) [4].



The primary goals of surgery are neural decompression and structural stabilization [2]. The most common surgical approach is posterior instrumentation using pedicle screws and rods spanning the segments above and below the fractured vertebra. In cases of severe anterior column collapse or dense retropulsion, a circumferential construct combining posterior fixation with an anterior corpectomy and cage placement may be necessary to ensure long-term mechanical stability [3, 4].

Conclusion

Effectively managing thoracolumbar fractures depends on accurately characterizing injury morphology, determining neurological status, and

evaluating posterior ligamentous complex integrity. The TLICS system provides a reliable framework for distinguishing stable injuries that respond well to orthotic bracing from complex, unstable injuries requiring rigid surgical stabilization and decompression.

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