Complete fracture-dislocation of the thoracolumbar spine without neurological deficit
A case report and review of the literature

Junfeng Zeng, MD, Quan Gong, MD, Hao Liu, MD*, Xin Rong, MD, Chen Ding, MD

Abstract

Rationale: Traumatic fracture of the thoracolumbar junction (T10–L2) is the most common fracture of the spinal column. Due to the disruption of the entire vertebrae column, the fracture-dislocation of the thoracolumbar spine is almost invariably associated with neurological injury. A complete fracture-dislocation of the thoracolumbar spine without neurological deficit is a rare entity.

Patient concerns: A 38-year-old man presented with severe low back pain after an accident when he was building a house. Comprehensive neurological examinations revealed intact neurological function.

Diagnoses: The plain X-ray and computed tomography revealed a complete fracture-dislocation of the L1 to L2 vertebrae.

Interventions: The patient underwent posterior reduction and internal fixation with screws and rods.

Outcomes: The neurological function was preserved postoperatively. The patient returned to work after 6 months.

Lessons: Early diagnosis is important before performing any dangerous maneuvers. Given the results of this case and the relevant literature, the prognosis of these patients is promising following surgical intervention.

Abbreviations: CT = computed tomography, SSEP = sensory evoked potential.

Keywords: fracture-dislocation, spine, surgery, thoracolumbar

1. Introduction

The thoracolumbar junction (T10–L2) represents a dramatic transition from the low mobile thoracic cage to the more mobile lumbar spine. Therefore, the thoracolumbar spine is the most common region to be exposed to traumatic spinal fractures. Fracture-dislocations of the thoracolumbar spine are often caused by high-energy trauma. Due to the severe disruption of the entire vertebrae column, such patients generally experience spinal cord injury.[1,2] Therefore, a complete fracture-dislocation of the thoracolumbar spine without neurological deficit is a rare entity. After carefully searching and reviewing the literature, we found that only 6 similar cases had been reported previously (Table 1).[3–8]

Here, we present a case of complete fracture-dislocation of the L1 to L2 vertebrae without neurological deficit. We report our experience with the successful management of this rare entity, and discuss the mechanism of spinal cord sparing.

2. Case description

A 38-year-old man presented with severe low back pain after suffering an accident while building a house. When he was working on a scaffold with a height of approximately 3 m, a 100 kg rebar fell on his back, and he was struck to the ground. On examination, his vital signs were normal (blood pressure: 128/74 mm Hg, heart rate: 77 bpm). The neurological examinations revealed that his Glasgow Coma Scale score was 15/15. He had severe tenderness in his lower back. The sensation and muscle strength of both lower limbs were normal, as were the patellar and Achilles tendon reflexes. No pathological reflex was noted.

The plain X-ray and computed tomography (CT) revealed a complete fracture-dislocation of the L1 to L2 vertebrae (Fig. 1). The bilateral pedicles of the L2 vertebrae, bilateral facet joints between L1 and L2, and right transverse process of the L1 to L3 vertebrae were fractured. Associated injuries were a fracture of the right 11th rib and a pulmonary contusion.

Surgery was performed 72 hours after the initial injury. Under general anesthesia, the patient was placed in a prone position. Sensory evoked potential responses (SSEP) monitoring was used to avoid neurological deterioration. A posterior middle line incision was made at the T12 to L4 level, and it revealed a severe contusion of the paravertebral muscles and a rupture of the supraspinous and interspinous ligaments. Laminectomy was performed at the L1 and L2 vertebrae for decompression. A small lesion of the dura at the L2 vertebrae level was found, but the spinal cord was intact. Bilateral transpedicular screws were...
inserted in the T12, L1, L3, L4, and L5 vertebrae. Another pedicle screw was inserted in the vertebral body of L2 for fixation and reduction. Realignment of the thoracolumbar spine was achieved with the rods (Fig. 2). A cross-link device was used for further fixation. Posterolateral bony fusion with autogenous and artificial bones were performed between T12 and L4 vertebrae. Continuous SSEP monitoring during the surgery showed no neurological dysfunction.

The postoperative course was satisfactory. The patient was allowed to walk with a plastic brace 48 hours postoperatively. He was discharged on the 4th day after surgery. He was weaned off the brace at 3 months. He returned to work at 6 months. At the 23-month follow up, the patient remained completely asymptomatic and had obtained a solid fusion (Fig. 3).

### Table 1

| Refs.          | Age, y, sex | Location | Fractured facet/pedicle | Etiology                     | Time of surgery | Surgery                                                                 | Outcome |
|----------------|-------------|----------|-------------------------|------------------------------|-----------------|------------------------------------------------------------------------|---------|
| Akay et al[3]  | 21, M       | T12–L1   | Right inferior facet of T12 and left superior facet and pedicle of L1 | Car accident                 | NA              | Posterior screws, rod fixation (T11, T12, L2, L3) and posterolateral fusion (T12–L1) | Good    |
| Phadnis et al[4] | 21, M    | L1–L2   | Right pedicle of L1 and left pedicle of L2 | Road traffic accident        | 48 h            | Posterior screws, rod fixation (T12, L1, L3, L4) and interbody fusion (L1–L2) | Good    |
| Hsieh et al[5] | 50, M       | T12–L1   | Right pedicle of L1 and bilateral facet joints between T12 and L1 | Fall from bicycle into a valley 10 m in depth | 3 h             | Posterior screws, rod fixation (T10, T1, L1, L3, L5) and posterolateral fusion (T12–L1) | Good    |
| Evans[6]       | 44, M       | T12–L1   | NA                      | Gym accident, 200kg bar fell on his lower back | <24 h           | Open reduction and internal fixation of the vertebral bodies (T12–L1) | Good    |
| Enishi et al[7] | 35, F      | L1–L2   | No                      | Motor vehicle accident      | 5 d             | Laminctomy followed by subtotal corpectomy (L2) and anterior fixation (L1–L3) | Good    |
| Rahimizadeh et al[8] | 19, F | L1–L2   | No                      | Fall from a height of 8 m | 14 d            | Posterior screws, rod fixation (T11, T12, L1, L3, L4, L5) and anterior corpectomy (L2) | Good    |
| Present case   | 38, M       | L1–L2   | Bilateral pedicles of L2 and bilateral facet joints between L1 and L2 | 100 kg rebar fell on his back and he fell from a scaffold of 3 m in height | 72 h            | Laminctomy L1, L2, posterior screws, rod fixation and posterolateral fusion (T12, L1, L2, L3, L4) | Good    |

F = female, M = male, NA = not available.

### Figure 1.

Preoperative anteroposterior (A) X-ray and sagittal (B), axial (C and D), and 3-dimensional (E and F) computed tomography of the complete fracture-dislocation of the L1 and L2 vertebrae.

### 3. Discussion

Because the thoracolumbar junction (T1–L2) acts as a dramatic transition from the relatively rigid thoracic spine to the more mobile lumbar spine, the thoracolumbar spine is the most common location of spinal fractures. Complete thoracolumbar fractures and dislocations are frequently associated with neurological deficits.[1,2] However fracture-dislocation of the thoracolumbar spine with intact neurological function is rarely reported. The present case provided us with a valuable experience to manage such a rare entity.

The probable mechanism for spinal cord sparing in such a completely fracture and dislocation is spontaneous decompression. Fractures of the pedicles and facets at the involved vertebrae have occurred in all reported cases.[3–11] Spontaneous decompression may result from fractured pedicles and facets, which separate the vertebral body from the vertebral arch (pedicles, facets, lamina, and spinous process). This separation may allow the severe dislocation of the vertebral body, and the spinal cord may have enough space to avoid any injury. In our case, fractures of the bilateral pedicles of the L2 vertebra and bilateral facet joints between L1 and L2 were observed, which may explain the preservation of neurological function.

Having an accurate and early diagnosis is critically important before any improper maneuver can be applied to patients with thoracolumbar fracture and dislocation with intact neurological function.
function. Any improper maneuver may damage the spinal cord and cause unintended neurological deficit due to the high degree of instability of the injured spine. Previous cases have reported that patients with this type of injury frequently suffered high-energy trauma, including traffic accidents and falling from great heights (Table 1). A delayed diagnosis may occur due to the associated various organ injuries. Spinal CT is recommended for patients involved in severe high-energy trauma.

The main treatment goals for such patients are realignment and fixation of the involved vertebrae to avoid unintended neurological deficits. Surgery has been recommended for fracture-dislocation of the thoracolumbar spine. The timing of surgery after traumatic fracture of the spine has been controversial. All of the previous reported cases obtained satisfactory results, regardless of the timing of surgery (Table 1). However, a log rolling maneuver technique should be applied to every movement before surgery. A posterior approach with long instrumentation (2 levels above and 2 levels below) is recommended due to the severe instability of the injured spine. In addition, short bony fusion, that is, posterolateral

![Figure 2](image1.png)

**Figure 2.** Postoperative anteroposterior (A) and lateral (B) X-rays showing good realignment of the thoracolumbar spine.

![Figure 3](image2.png)

**Figure 3.** Anteroposterior (A) X-ray and sagittal (B) computed tomography of the thoracolumbar spine obtained at 23 months after surgery showing good alignment and solid fusion.
or interbody fusion, should be applied. In the present case, laminectomy was performed at the involved level for decompression; and long instrumentation and long posterolateral fusion were performed for fixation and to avoid implant failure. Solid fusion and a satisfactory outcome were obtained at the 23-month follow-up.

4. Conclusion

Complete fracture-dislocation of the thoracolumbar spine without a neurological deficit is a rare entity. Early diagnosis is important before performing any dangerous maneuvers. Long instrumentation with bony fusion is the recommended surgical method. The prognosis is promising after the patients undergo surgery.

References

[1] Wood KB, Li W, Lebl DR, et al. Management of thoracolumbar spine fractures. Spine J 2014;14:145–64.
[2] Wang F, Zhu Y. Treatment of complete fracture-dislocation of thoracolumbar spine. J Spinal Disord Tech 2013;26:421–6.
[3] Akay KM, Baysefer A, Kayali H, et al. Fracture and lateral dislocation of the T12-L1 vertebrae without neurological deficit—case report. Neurol Med Chir (Tokyo) 2003;43:267–70.
[4] Phadnis AS, Tan CJ, Raman AS, et al. Fracture and complete dislocation of the spine with a normal motor neurology. Injury Extra 2006;37:479–83.
[5] Hsieh CT, Chen GJ, Wu CC, et al. Complete fracture-dislocation of the thoracolumbar spine without paraplegia. Am J Emerg Med 2008; 26:633.e5–7.
[6] Evans L J. Images in clinical medicine. Thoracolumbar fracture with preservation of neurologic function. N Engl J Med 2012;367:1939.
[7] Enishi T, Kato S, Sogo T. Surgical treatment for significant fracture-dislocation of the thoracic or lumbar spine without neurologic deficit: a case series. J Orthop Case Rep 2014;4:43–5.
[8] Rahimizadeh A, Asgari N, Rahimazadeh A. Complete thoracolumbar fracture-dislocation with intact neurologic function: explanation of a novel cord saving mechanism. J Spinal Cord Med 2017;39:1–10.
[9] Magerl F, Aebi M, Gertzbein SD, et al. A comprehensive classification of thoracic and lumbar injuries. Eur Spine J 1994;3:184–201.
[10] Liu Y, Shi CG, Wang XW, et al. Timing of surgical decompression for traumatic cervical spinal cord injury. Int Orthop 2015;39: 2457–63.
[11] Kerwin AJ, Frykberg ER, Schinco MA, et al. The effect of early surgical treatment of traumatic spine injuries on patient mortality. J Trauma 2007;63:1308–13.