





# Management of Thoracolumbar Fracture Dislocation Resulting from High Energy Trauma: Clinical Case Series

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## ABSTRACT

Thoracolumbar fracture dislocations are important cause of morbidity in patients with a history of accidents causes high energy trauma. In this type of spinal trauma, all three columns of the spine affect due to high-energy and may cause serious neurological deficits. There is two major surgical options when stabilization is indicated. Short segment and long segment stabilization options have their own advantages and disadvantages. In this brief report we will present the outcomes of our case series with thoracolumbar fracture dislocations that were managed with long segment stabilization. In our case series, neurological recovery was achieved in 4 of 6 patients to whom we applied emergency surgical treatment within 8 hours. We showed that reduction, stabilization and decompression performed with emergency surgical treatment had positive effects on the neurological recovery of patients.

## INTRODUCTION

Thoracolumbar fractures are the most common injuries to the spine and account for more than 50% of all traumatic spine cases. However, fracture dislocations are rare and occur in less than 3%. Thoracolumbar fracture dislocations are an important cause of morbidity and mortality in these patients.<sup>[1]</sup> Neurological deficit is observed in the majority of cases and always requires urgent surgical reduction and stabilization.<sup>[2]</sup> In this study, cases in which thoracolumbar fracture dislocation was detected as a result of high-energy trauma and urgently operated on in our clinic are discussed in light of the literature.

In our case series, there were 5 male and 1 female patient.

Their ages varied between 14 and 62. Most of the time, a fall from height was the mechanism of the accident. All patients were indicated for surgery, and we operated on them and stabilized the vertebrae with long-segment posterior fixation (Table 1).

## CASE REPORT

### Case 1

A 24-year-old male patient was injured as a result of falling from a height. He was brought to the emergency department with complaints of waist and back pain and weakness in both lower extremities. On neurological examination, both lower extremities were paraplegic and anesthetized

**Table I.** Demographic characteristics of the patients

No	Age, Gender	Trauma	Preop Neurological examination	Pathology	Additional pathology	Surgery	Postop Complication	Follow-up	Last Neurological examination
1	24, M	Fall from height	ASIA-A	T10-T11 fracture dislocation	Right pulmonary contusion	T8-L2 posterior stabilization and reduction	(-)	8 year	ASIA-B
2	24, M	Blunt trauma	ASIA-A	T8-9 fracture dislocation	Sternum fracture, multiple costa fracture and left hemothorax	T5-T12 posterior stabilization and reduction T8 total laminectomy, duraplasty	(-)	4 year	ASIA-A
3	62, M	Fall from height	ASIA-A	T12-L1 fracture dislocation	(-)	T9-L4 posterior stabilizasyon, redüksiyon	(-)	4 year	ASIA-E
4	14, W	Fall from height	ASIA-A	L1-2 fracture dislocation, L5 comperssion fracture	(-)	T10-S1 posterior stabilization and reduction, L2 total laminectomy, duraplasty	(-) (-)	4 year	ASIA-D
5	52, M	Fall from height	ASIA-A	T11-T12 fracture dislocation	(-)	T7-L4 posterior stabilization and reduction	CSF	5 year	ASIA-A
6	23, M	Car accident	ASIA-A	T11-12 fracture dislocation	Right hemothorax	T8-L3 posterior stabilization and reduction T12 total laminectomy, duraplasty	Fistula, abscess	2 year	ASIA-D

below the T11 level (ASIA A). In the patient's spinal computed tomography (CT) scans, a fracture dislocation (AO Spine Type C injury) was detected at the T10-T11 level (Figure 1A-1B), and a contusion in the right lung was detected in the thorax CT. The patient, whose general condition was stable, was taken into emergency surgery. T8-L2 posterior stabilization was performed (Figure 1C-1D). The patient was transferred to the physical therapy clinic on the 3rd postoperative day. The follow-up period was 8 years. His last neurological examination was observed as ASIA-B.

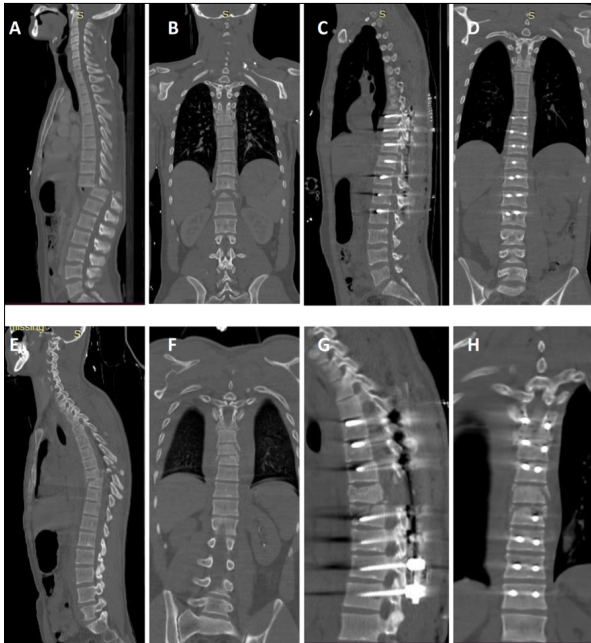
### Case 2

A 24-year-old male patient was brought to the emergency room with an injury caused by a concrete pump hitting his back during construction. In his neurological examination, his bilateral lower extremities were paraplegic and anesthetized below the T8 level (ASIA A). The patient had a T8-9 fracture dislocation (AO Spine Type C injury) (Figure 1E-1F), sternum fracture, multiple rib fractures, and left hemothorax, which were detected in the CT examina-

tions. A tube thoracostomy was performed. The patient, whose general condition was stable, was urgently operated on, and T5-T12 posterior stabilization was performed. T8 total laminectomy was performed (Figure 1G-1H), bone fragments compressing the spinal cord were removed, and duraplasty was performed. The patient was transferred to the physical therapy unit on the 7th postoperative day. The follow-up period was 4 years. His last neurological examination was evaluated as ASIA-A.

### Case 3

A 62-year-old male patient was brought to the emergency room after falling from a height. On neurological examination, both lower extremities were paraplegic and anesthetized below the L1 level (ASIA A). Spinal CT scans revealed a fracture dislocation (AO Spine Type C injury) at the T12-L1 level (Figure 2A-2B). The patient, who had no additional pathology and whose general condition was stable, was operated on urgently. The patient, who underwent posterior stabilization between T9-L4 (Figure 2C-2D), was transferred to the physical therapy unit on the 3rd postoperative day. The follow-up period was 4 years.



**Figure 1.** (a) Preoperative sagittal thoracolumbar computed tomography (CT) image of Case 1, (b) Preoperative coronal thoracolumbar CT image of Case 1, (c) Postoperative sagittal thoracolumbar CT image of Case 1, (d) Postoperative coronal thoracolumbar CT image of Case 1, (e) Preoperative sagittal thoracolumbar CT image of Case 2, (f) Preoperative coronal thoracolumbar CT image of Case 2, (g) Postoperative sagittal thoracolumbar CT image of Case 2, (h) Postoperative coronal thoracolumbar CT image of Case 2.

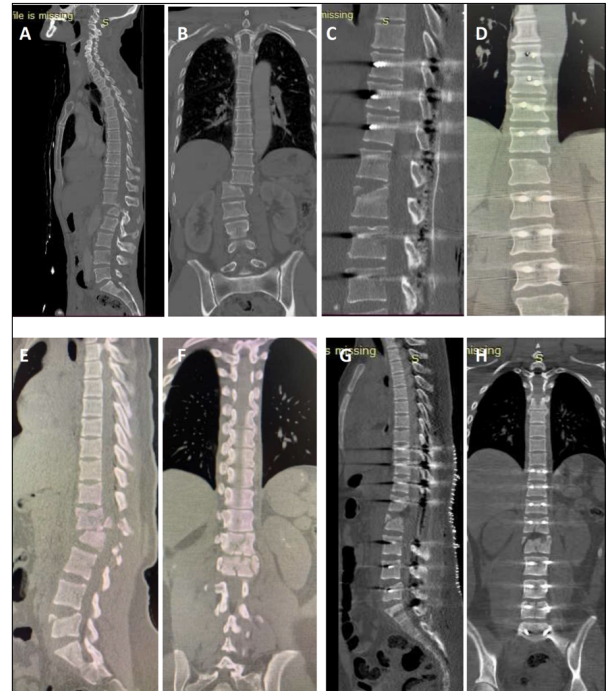
His last neurological examination was observed as intact, ASIA-E.

#### Case 4

A 14-year-old girl was brought to the emergency department after falling from a height. On neurological examination, both lower extremities were paraplegic and anesthetized below the L2 level (ASIA A). The patient, whose spinal CT examination revealed L1-2 fracture dislocation (AO Spine Type C injury) and L5 partial compression, was taken into surgery urgently (Figure 2E-2F). Posterior stabilization was performed between T10-S1. L2 total laminectomy was performed, bone fragments in the spinal canal were removed, and duraplasty was performed (Figure 2G-2H). She was transferred to the physical therapy unit on the 5th postoperative day. The follow-up period was 4 years. Her last neurological examination was evaluated as ASIA-D.

#### Case 5

A 52-year-old male patient was brought to the emergency room due to a fall from a height. His neurological examination revealed paraplegia in both lower extremities and anesthesia below the T11 level (ASIA A). The patient, whose examinations revealed a T11-T12 fracture dislocation (AO Spine Type C injury) (Figure 3A-3B), was operated on urgently, and a T7-L4 posterior stabilization and

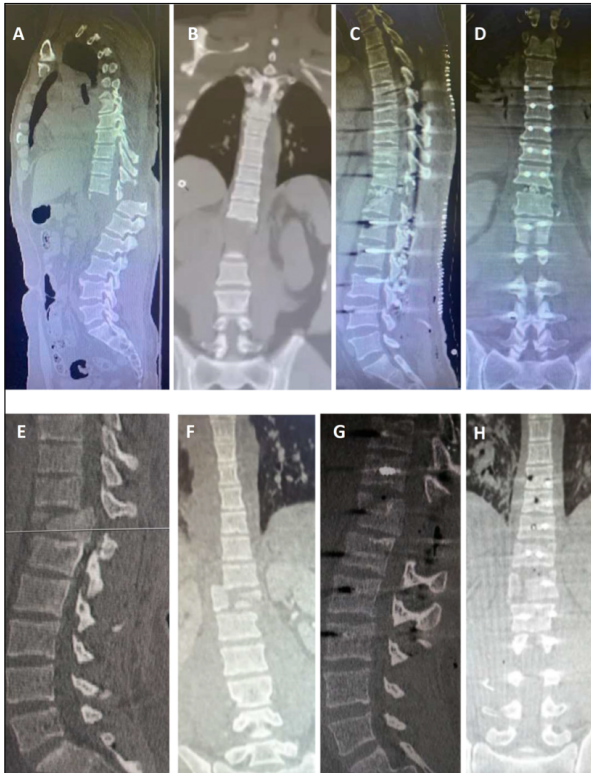


**Figure 2.** (a) Preoperative sagittal thoracolumbar CT image of Case 3, (b) Preoperative coronal thoracolumbar CT image of Case 3, (c) Postoperative sagittal thoracolumbar CT image of Case 3, (d) Postoperative coronal thoracolumbar CT image of Case 3, (e) Preoperative sagittal thoracolumbar CT image of Case 4, (f) Preoperative coronal thoracolumbar CT image of Case 4, (g) Postoperative sagittal thoracolumbar CT image of Case 4, (h) Postoperative coronal thoracolumbar CT image of Case 4.

reduction operation was performed (Figure 3C-3D). The follow-up period was 5 years. His last neurological examination was evaluated as ASIA-A.

#### Case 6

A 24-year-old male patient was brought to the emergency room after an in-car traffic accident. In his neurological examination, his bilateral lower extremities were paraplegic and anesthetized below the L1 level (ASIA A). A spinal CT scan revealed a T11-T12 fracture dislocation (AO Spine Type C injury) and hemothorax in the right lung (Figure 3E-3F). A tube thoracostomy was performed on the right lung. The patient, whose general condition was stable, was taken into emergency surgery. Posterior stabilization was performed between T8-L3 (Figure 3G-3H). With T12 total laminectomy, bone fragments that were compressing the spinal cord from the anterior were pushed anteriorly, and duraplasty was performed. External lumbar drainage was installed in the patient, who was found to have a CSF fistula during postoperative follow-up. Vancomycin and Meropenem treatment were started for the patient, who had fever, neck stiffness, and pus from the wound on the 12th postoperative day. When pan-resistant *Klebsiella pneumoniae* grew in the CSF culture, Polymyxin, Fosfomycin, and Meropenem treatment was started. Due



**Figure 3.** (a) Preoperative sagittal thoracolumbar CT image of Case 5, (b) Preoperative coronal thoracolumbar CT image of Case 5, (c) Postoperative sagittal thoracolumbar CT image of Case 5, (d) Postoperative coronal thoracolumbar CT image of Case 5, (e) Preoperative sagittal thoracolumbar CT image of Case 6, (f) Preoperative coronal thoracolumbar CT image of Case 6, (g) Postoperative sagittal thoracolumbar CT image of Case 6, (h) Postoperative coronal thoracolumbar CT image of Case 6.

to the development of an abscess in the operation area in the control MRI, the patient was taken into re-operation, and abscess drainage was performed and the CSF fistula was repaired. The patient, whose antibiotic treatment was completed, was transferred to the physical therapy unit at the 8th postoperative week. The follow-up period was 2 years. His last neurological examination was evaluated as ASIA-D.

## DISCUSSION

Thoracolumbar fracture dislocations are treated surgically with long-segment posterior stabilization. While surgical fixation allows early rehabilitation, the chance of neurological recovery is rare. Many cases of thoracolumbar fracture dislocations without spinal cord injury have been reported in the literature. This is an issue that needs to be taken into consideration in terms of the risk of neurological deficits during the transfer of the patient to the operating table and during surgical treatment. Kanna et al.<sup>[3]</sup> reported in their case series of 36 thoracolumbar fracture dislocation cases without spinal cord injury that they divided these

injuries radiologically into four types: coronal translation (Type 1), sagittal translation (Type 2), anterior-combined translation (Type 3a), and posterior-combined translation (Type 3b). They reported that translation can occur in one or two planes, depending on the variability in the distortion of the posterior ligamentous structures and facet joints.<sup>[3]</sup> Three of our cases were sagittal translation (Type 1) and three were posterior-combined (Type 3b) injuries.

Chokshi et al.<sup>[1]</sup> applied short-level posterior stabilization, including the fracture level, to 50 patients who were operated on with the diagnosis of thoracolumbar fracture dislocation. Their average follow-up period was 18.4 months, and they argued that including the fracture level in short-segment fixation in thoracolumbar fracture dislocations could eliminate the need for traditional long-segment fixation.<sup>[1]</sup> Similarly, Mittal et al.<sup>[4]</sup> reported that 12 of the 26 cases with thoracolumbar fracture dislocation were stabilized at a long level, two levels above and two levels below the fracture level, and applied short-level posterior stabilization to 14 of them, one level above and one level below, including the fracture level. Their follow-up period was 8.64 months, and they reported that short-segment stabilization can be used in the treatment of thoracolumbar fracture dislocations because short-segment stabilization is associated with less blood loss, shorter intraoperative time, and has similar radiological and clinical results to long-segment fixation.<sup>[4]</sup>

Wang et al.<sup>[5]</sup> reported that due to the high level of instability, early surgical treatment with decompression, reduction, and stabilization is the best policy in patients with thoracolumbar fracture dislocation, and they recommended long-level stabilization in these cases due to higher rigidity.<sup>[5]</sup> We preferred reduction and fusion with long-level stabilization in all our cases. In a series of 53 thoracolumbar fracture dislocation cases, Farooque et al.<sup>[6]</sup> applied interbody fusion with fragmented autogenous bone grafts to the fracture level after long-level fixation. They achieved 90.56% fusion at the end of one-year follow-up. They also stated that one upper and one lower short-segment instrumentation at the fracture level could provide 360-degree fusion and adequate spinal stability in non-ambulatory patients.<sup>[6]</sup>

Although it is known that the prognosis of patients with incomplete spinal cord injury is much better, it has been reported that patients with complete injuries can also benefit from early surgical decompression within 24 hours. Regarding the timing of surgical decompression after acute spinal cord injury, it has been emphasized that the optimal duration should be 8 hours, especially in animal experiments.<sup>[7]</sup> In our case series, neurological recovery was achieved in 4 of 6 patients to whom we applied emergency surgical treatment within 8 hours.

## Conclusion

Thoracolumbar fracture dislocations are spinal traumas that affect all three columns of the spine due to high-energy traumas and cause serious neurological deficits. We

showed that reduction, stabilization, and decompression performed with emergency surgical treatment may have positive effects on the neurological recovery of patients.

#### Informed Consent

Retrospective study.

#### Peer-review

Externally peer-reviewed.

#### Authorship Contributions

Concept: A.B.; Design: A.B.; Supervision: E.Ç.; Materials: A.B., J.H., A.F.R.; Data: A.B., P.K.B., J.H., A.F.R., E.Ç.; Analysis: P.K.B.; Literature search: A.B., P.K.B.; Writing: A.B., P.K.B.; Critical revision: E.Ç.

#### Conflict of Interest

None declared.

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## Yüksek Enerjili Travma Sonucu Oluşan Torakolomber Kırıklı Çıkıkların Yönetimi: Klinik Vaka Serisi

Torakolomber kırıklı çıkıklar, yüksek enerjili travmaya neden olan kaza öyküsü olan hastalarda önemli bir morbidite nedenidir. Bu tür omurga travmalarında omurganın üç sütunu da yüksek enerji nedeniyle etkilenir ve ciddi nörolojik defisitlere neden olabilir. Stabilizasyon endike olduğunda iki ana cerrahi seçenek vardır. Kısa segment ve uzun segment stabilizasyon seçeneklerinin kendilerine göre avantaj ve dezavantajları bulunmaktadır. Bu raporda uzun segment stabilizasyonu ile tedavi edilen torakolomber kırıklı çıkıklı olgu serimizin sonuçlarını sunacağız. Olgu serimizde acil cerrahi tedavi uyguladığımız 6 hastanın 4'ünde 8 saat içinde nörolojik iyileşme sağlandı. Acil cerrahi tedavi ile yapılan redüksiyon, stabilizasyon ve dekompresyonun hastaların nörolojik iyileşmesi üzerine olumlu etkileri olduğunu gösterdik.

**Anahtar Sözcükler:** Cerrahi tedavi; spinal travma; torakolomber kırıklı çıkık.