

Dorso-Lumbar Burst Fractures Secondary to a Peculiar Tipper Truck Injury: A Report on Two Cases

Nayil Khursheed¹ Arif Sarmast¹ Altaf Ramzan¹ Bashir Dar²

¹Department of Neurosurgery, Sheri-Kashmir Institute of Medical Sciences, Srinagar, Jammu and Kashmir, India

²Department of Anesthesiology, Sheri-Kashmir Institute of Medical Sciences, Srinagar, Jammu and Kashmir, India

Address for correspondence Nayil Khursheed, MS, MCh, Department of Neurosurgery, Sheri-Kashmir Institute of Medical Sciences, Srinagar, Jammu and Kashmir 190011, India (e-mail: nayilkhursh@gmail.com).

Indian J Neurotrauma 2015;12:140–143.

Abstract

Spinal injury is a disabling event. Disability primarily depends on the degree of cord injury. Vertebral bone injuries are a frequent accompaniment. Burst fracture of the vertebral body indicates a high-impact nature of injury. Among the various causes of burst fractures with cord injury, road traffic accidents are the most common mode of injury. We report two cases of fractures of dorsolumbar junction in a peculiar truck accident. Both the patients had burst fractures, and presented and continued to have paraplegia despite surgery. The authors want to highlight this peculiar spinal injury and at the same time want to educate the neurosurgeons about this mode of injury. This type of injury has not been reported earlier.

Keywords

- ▶ spinal fractures
- ▶ burst fracture
- ▶ dorsolumbar fracture
- ▶ tipper truck injury

Road traffic accident is the most common mode of spinal injury. The incidence of burst fractures is maximum at the thoracolumbar junction because the thoracic spine has unique anatomical and biomechanical features. Minimal encroachment of spinal canal at this level may produce severe deficits.^{1,2} We introduce two new peculiar cases of dorsolumbar burst fractures secondary to a peculiar tipper truck injury to the literature.

Case Description

Case 1

A 35-year-old male nonrestrained tipper driver was unloading sand from his tipper. At the time of elevation of the tipper, he had forgotten to open the tail gate of the body of the tipper, and as a result the whole load of the sand got accumulated at the lower part of the body of the tipper and resulted in imbalance and overturning of the truck. The truck driver sustained severe impact on his back, which caused pain at the local site along with inability to move the lower limbs. He did not lose consciousness during this

episode. He was rescued by the bystanders and shifted to the Accident and Emergency department of our hospital within 4 hours of the injury. He received methyl-prednisolone-succinate 30 mg/kg stat and 5.4 mg/kg/h for the next 23 hours. On examination he was conscious and coherent. The upper limbs were normal. He had grade 0/5 power in both the lower limbs. There was complete loss of sensation below D11–D12 level. Imaging revealed burst fracture of D-12 vertebra (▶ **Fig. 1A**). He underwent transthoracic-retropleural 11th-rib bed approach; D-12 corpectomy and instrumentation was done using two titanium 6- × 35-mm screws and a nonexpandable cage. There was a dural tear that was sealed with fibrin glue and gel foam. There was severe thecal sac compression. All the fragments within the canal were removed. Wound was closed in layers over a vacuum drain. Postoperative period was uneventful and X-ray showed instrumentation in place (▶ **Fig. 1B**). On a follow-up of 3 years, there has been no improvement in his neurologic status. He also has been experiencing severe neuropathic pain in both his lower limbs for which he receives pregabalin on and off.

received

July 17, 2015

accepted

November 2, 2015

published online

December 17, 2015

© 2015 Neurotrauma Society of India

DOI <http://dx.doi.org/10.1055/s-0035-1570093>.
ISSN 0973-0508.

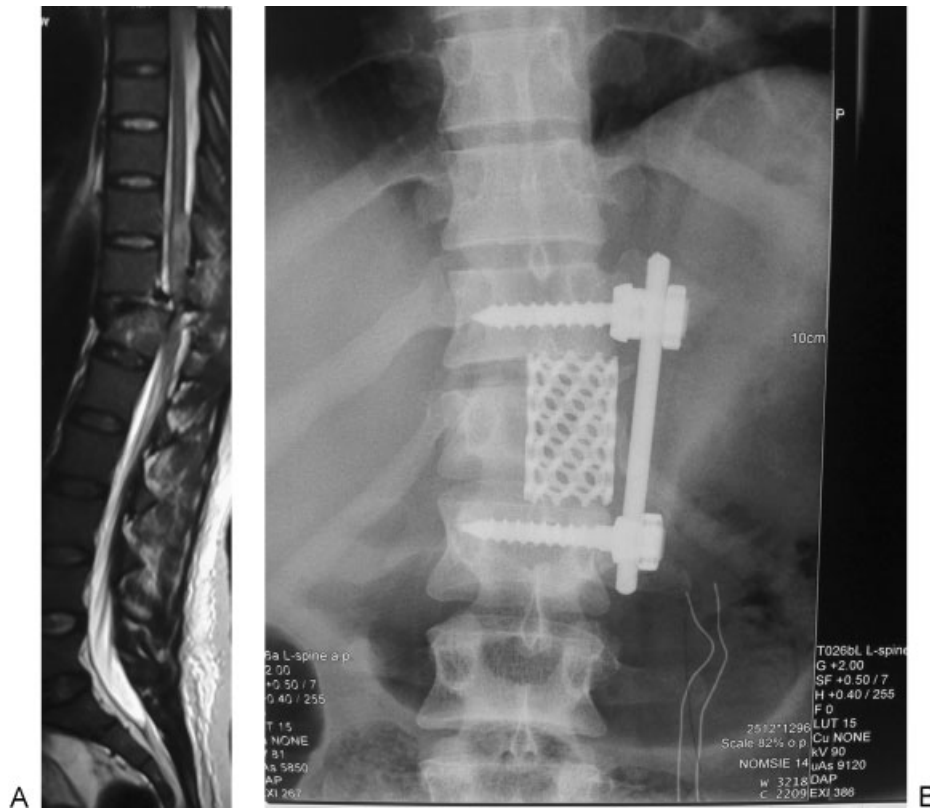


Fig. 1 (A) MRI sagittal section shows fractured D-12 vertebral body causing severe thecal sac compression and signal changes in the cord. (B) Postoperative X-ray showing aligned spine with instrumentation in place.

Case 2

A 42-year-old male unrestrained tipper driver was unloading boulders from his tipper. At the time of elevation of the tipper, he forgot to open the tail gate of the body of the tipper and the truck overturned. He also had an impact over his back and experienced severe pain along with inability to move his lower limbs. He was rescued by the bystanders and shifted to the Accident and Emergency department of our hospital

within 10 hours of the injury. Methyl-prednisolone-succinate was not administered to him. On examination, he was conscious and oriented. The upper limbs were normal. He had grade 0/5 power in both the lower limbs. There was complete loss of sensation below D-12 level. Imaging revealed burst fracture of L-1 vertebra (► **Fig. 2A** and **B**). He underwent translumbar retroperitoneal 12th-rib bed approach; L-1 corpectomy and instrumentation was done using two

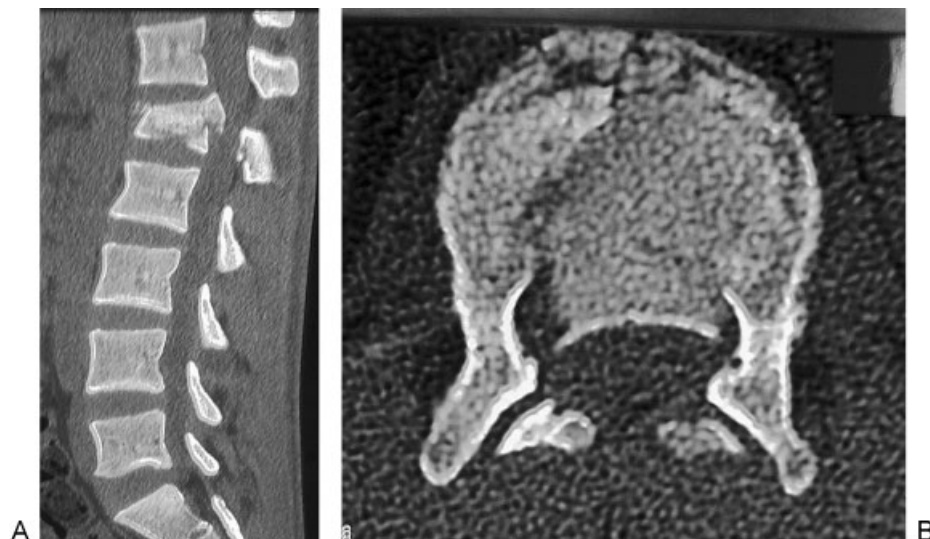


Fig. 2 CT scan sagittal (A) and axial (B) sections show fractured L-1 body with intracanalicular bone fragments.

titanium 6- × 40-mm screws and a nonexpandable cage. The spinal canal was cleared of all the bony fragments. A titanium rod was put between the screws. Wound was closed in layers over a vacuum drain. Postoperative period was uneventful. On a 6-month follow-up, he has not improved in neurologic status.

Discussion

Road traffic accident is the most common mode of spinal injury. The largest proportion has been observed in West Africa at 89%. The lowest proportions are found in Greenland at 4% as well as in Pakistan and Nepal both at 7%. Sports accidents causing spinal cord injuries occur most frequently during diving, gymnastics, and rugby. From Russia it has been reported that 33% of all accidents occurred during gymnastics.¹⁻⁶ As per report of the International Conference (Spinal Injuries Management, New Delhi, 1995), the incidence of spinal injury was estimated at 15 new cases per million per year in India. This translates into 15,000 new cases per year, and with a backlog of 10 years, the prevalence exceeds 0.15 million.⁷

Spinal injury due to this type of peculiar accident has not been reported before (►Fig. 3A and B). The thoracic spine has unique anatomical and biomechanical features. It is much stiffer than the lumbar spine because of restraining effect of both the rib cage and its relatively thinner discs. Moreover, the spinal canal in dorsal region is narrower, and hence even a minimal encroachment of spinal canal may

produce severe deficits. Also, the blood supply of dorsal cord is relatively sparse as compared with the other areas of the cord, and hence could explain the occurrence of spinal cord injury with less compression or kyphotic deformity than in the lumbar spine.⁸⁻¹¹

Spinal fractures are classified into minor and major fractures. Minor fractures include fractures of spinous process, laminae, and pars interarticularis. Major fractures are classified into four main categories; burst fractures, compression fractures, fracture dislocation, and seat-belt injuries. Burst fractures were first described by Holdsworth in 1963. The incidence of burst fractures is maximum at the thoracolumbar junction and occurs frequently in high-energy traumas that are most commonly associated with falls and traffic accidents. Holdsworth proposed a two-column model of spinal stability by separating the spine into an anterior weight-bearing column of the vertebral body and a posterior tension-bearing column of the posterior ligamentous complex (PLC). He termed burst fractures as unstable if the PLC was disrupted.¹² Denis in 1983 described a three-column classification of spinal fractures. He proposed that injury to the middle column, that is, the posterior portion of the vertebral body, posterior longitudinal ligament, and posterior disc was sufficient to create instability. He also classified unstable fractures into three types: mechanical (first degree), neurologic (second degree), or combined mechanical/neurologic (third degree).¹³ In 1994, McAfee et al proposed another classification and treatment scheme. He classified the injuries based on how the middle column failed, with burst fractures exhibiting middle column failure in compression. He also distinguished between burst fractures with and without PLC disruption. A burst fracture with PLC disruption is considered to be unstable. It is widely accepted that the posterior ligaments have probably failed if there is greater than 30 degrees of kyphosis and/or 50% of vertebral body height loss on plain radiographs.¹⁴ Zeng et al also found stress concentration at the base of the pedicle, so they believe that the injury initiate as from the base of the pedicle.¹⁵ Of note is that all burst fractures are characterized by a rupture of the posterior wall of the vertebral body and a shift of fracture fragments to the spinal canal. These fractures fragments occupying the spinal canal can lead to compression of nerve roots, cauda equina, or spinal cord, and/or spinal stenosis, resulting in clinically evident neurologic symptoms. Burst fracture is a result of a compressive high-energy injury (axial loading), and it mostly occurs at thoracolumbar junction where there is fulcrum of increased motion that makes it more vulnerable to traumatic injury. Primary force is an axial load to the vertebral body, which leads to end plate failure as disc is driven into the body. It may or may not involve a flexion bending moment. Posterior column may fail in tension. Both the drivers had such an impact on their backs when their respective trucks capsized and landed, which caused their upper torso to be thrown forward, hence causing flexion at the dorsolumbar junction resulting in spinal fracture.¹⁶

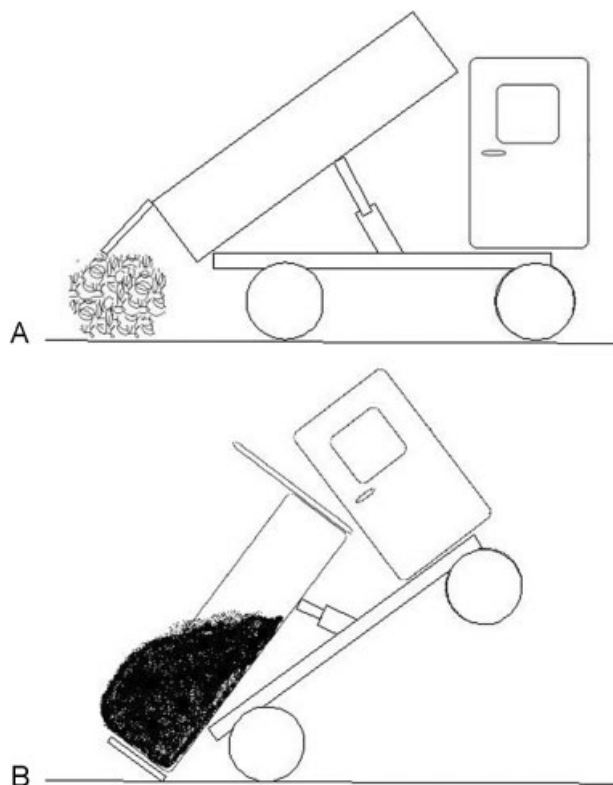


Fig. 3 Schematic representation showing the normal unloading from truck when the tail gate is open (A) and when not opened (B).

The indications for surgical treatment in spinal fractures are as follows:

- Neurologic impairment
- Canal encroachment (50%)
- Vertebral body wedging (50%)
- Kyphosis (25 degrees) at the injury level, measured between the upper and lower adjacent noninjured vertebrae.

The surgical treatment of spinal burst fracture include anterolateral approach as this approach offers optimal chance of canal clearance and also limits the number of motion segments fused. Posterior approach no doubt is more familiar to a neurosurgeon, but it has the disadvantage of inadequate spinal canal decompression. Anterolateral approach with screws, cage, and rod instrumentation is becoming the standard now in the management of burst fractures.¹⁷

Conclusion

Dorsolumbar burst fractures are not uncommon disabling spinal injuries. Efforts to generate awareness of the truck drivers who drive tippers about the mechanism and morbidity of such injuries may in future reduce the number of such peculiar accidents and consequent morbidity.

References

- 1 Kawu AA. Pattern and presentation of spine trauma in Gwagwalada-Abuja, Nigeria. *Niger J Clin Pract* 2012;15(1): 38–41
- 2 Marré B, Ballesteros V, Martínez C, et al. Thoracic spine fractures: injury profile and outcomes of a surgically treated cohort. *Eur Spine J* 2011;20(9):1427–1433
- 3 Chiu WT, Lin HC, Lam C, Chu SF, Chiang YH, Tsai SH. Review paper: epidemiology of traumatic spinal cord injury: comparisons between developed and developing countries. *Asia Pac J Public Health* 2010;22(1):9–18
- 4 Cripps RA, Lee BB, Wing P, Weerts E, Mackay J, Brown D. A global map for traumatic spinal cord injury epidemiology: towards a living data repository for injury prevention. *Spinal Cord* 2011; 49(4):493–501
- 5 van den Berg ME, Castellote JM, Mahillo-Fernandez I, de Pedro-Cuesta J. Incidence of spinal cord injury worldwide: a systematic review. *Neuroepidemiology* 2010;34(3):184–192, discussion 192
- 6 Wyndaele M, Wyndaele JJ. Incidence, prevalence and epidemiology of spinal cord injury: what learns a worldwide literature survey? *Spinal Cord* 2006;44(9):523–529
- 7 Mukherjee AK. *Spine Injury and Disability Care*. New Delhi, India: Vikas Publishing House; 1999
- 8 Andriacchi T, Schultz A, Belytschko T, Galante J. A model for studies of mechanical interactions between the human spine and rib cage. *J Biomech* 1974;7(6):497–507
- 9 Bohlman HH, Freehafer A, Dejak J. The results of treatment of acute injuries of the upper thoracic spine with paralysis. *J Bone Joint Surg Am* 1985;67(3):360–369
- 10 el-Khoury GY, Whitten CG. Trauma to the upper thoracic spine: anatomy, biomechanics, and unique imaging features. *AJR Am J Roentgenol* 1993;160(1):95–102
- 11 Schweighofer F, Hofer HP, Wildburger R, Stockenhuber N, Bratschitsch G. Unstable fractures of the upper thoracic spine. *Langenbecks Arch Chir* 1997;382(1):25–28
- 12 Holdsworth FW, Hardy A. Early treatment of paraplegia from fractures of the thoraco-lumbar spine. *J Bone Joint Surg Br* 1953; 35-B(4):540–550
- 13 Denis F. The three column spine and its significance in the classification of acute thoracolumbar spinal injuries. *Spine* 1983; 8(8):817–831
- 14 McAfee PC, Yuan HA, Fredrickson BE, Lubicky JP. The value of computed tomography in thoracolumbar fractures. An analysis of one hundred consecutive cases and a new classification. *J Bone Joint Surg Am* 1983;65(4):461–473
- 15 Zeng ZL, Zhu R, Li SZ, et al. Formative mechanism of intracanal fracture fragments in thoracolumbar burst fractures: a finite element study. *Chin Med J (Engl)* 2013;126(15):2852–2858
- 16 Holdsworth FW. Fractures, dislocations, and fracture dislocations of the spine. *J Bone Joint Surg Br* 1963;45:6–20
- 17 Heary RF, Kumar S. Decision-making in burst fractures of the thoracolumbar and lumbar spine. *Indian J Orthop* 2007;41(4): 268–276