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CASE REPORT

Unusual cord transection in a patient with traumatic spondylolisthesis

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ABSTRACT

Spinal cord injury is one of the most debilitating injuries in patients with spinal trauma. Cord injury may range from simple cord edema to frank transection. Cord transection is the most severe form of cord injury as it results in complete and irreversible loss of all neural functions. Generally, it is a result of unstable spinal fractures with associated spondylolisthesis or spondyloptosis. Generally, the level of cord transection corresponds to the level of spinal fracture/spondylolisthesis. However, here we are presenting a case having a traumatic spinal fracture with spondylolisthesis where the level of cord transection was much higher than the level of the spinal fracture. Due to the traumatic traction, the cord distal to transection is displaced inferior leaving behind a long segment of the empty thecal sac.

Key words: Cord transection, paraparesis, spondylolisthesis, trauma

Introduction

Spinal cord injury (SCI) is a cause of significant morbidity as most patients survive following cord injury. Etiology and incidence of SCI may vary. The annual incidence varies in different countries. In developed countries, it has been estimated to be 11.5–53.4/million.[1] Leading causes of SCI include motor vehicle accidents, falls and acts of violence.[2] There are various grades of SCI ranging from mild focal edema to complete cord transection. It is almost always associated with vertebral column injuries. Diagnosis of vertebral injuries is easily made on computed tomography (CT). However, a good quality magnetic resonance imaging (MRI) is necessary for the evaluation of cord injuries. It can detect the extent of injury as well as the associated ligament injuries.

Case Report

A 25-year-old gentleman, a victim of high-velocity trauma (bike rider hit by a four-wheeler from behind), was brought to our trauma center. He had a history of loss of consciousness and one episode of vomiting. Patient was paraplegic. On arrival, patient was conscious (Glasgow Coma Scale-15) and airway and breathing were normal. Patient had a pulse rate of 98 and blood pressure of 140/80. Pelvic and chest compression tests were positive. Focused assessment with sonography in trauma was positive with mild hemoperitoneum.

Noncontrast computerized tomography (NCCT) head with cervical spine and contrast enhanced CT of the chest and abdomen were done. It revealed transverse fracture through L2 vertebral body with grade III spondylolisthesis of L2 over L3 causing severe neural canal compromise [Figure 1]. Patient also had aortic dissection at the isthmus with traumatic aneurysm formation, mediastinal hematoma, and right mild hemothorax [Figure 1]. He had grade II liver laceration with hemoperitoneum. Patient had multiple pelvic fractures including iliac bone and ischiopubic rami. NCCT head revealed mild intraventricular hemorrhage.

After initial resuscitation and endovascular management of the aortic injury, detailed neurological evaluation was done. Patient had a complete loss of sensation and motor power of both lower limbs in areas distal to L1 dermatome with complete loss of bladder and bowel control. To evaluate the neurological injuries, a MRI was done which revealed complete cord transection at the lower border of D11 and absence of cord tissue from D11 to L1 levels. The distal cord segment was noted to be lying clumped up inferiorly at L2-L3 level with severe compression and stretching across the site of spondylolisthesis [Figures 2 and 3]. However, the

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continuity of cord could be clearly made out at the level of spondylolisthesis.

The spinal injury was managed by fixation with rods and pedicle screws (D12, L1, L3, and L4). Aortic injury was managed by endovascular stent-graft [Figure 4].

Discussion

Spondylolisthesis is a form of spinal dislocation in which one spinal segment is displaced relative to the rest of the spine.[3,4] In cases with high-grade spondylolisthesis, all three spinal columns are disrupted.[5] In such cases, traumatic impact causes either a flexion-rotation stress or a shearing force that fractures the facets and ruptures ligaments, which results in spinal disarticulation.

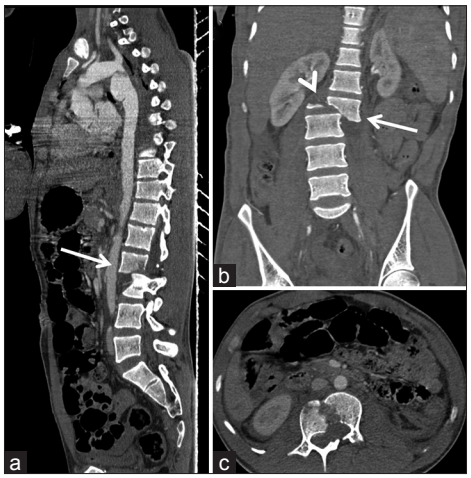

Figure 1: Sagittal (a) and coronal (b) reformatted and axial images (c) from a contrast-enhanced computed tomography, showing grade III spondylolisthesis of L2 over L3 (arrows) with inferior endplate fracture of L2 (arrowhead)

Traumatic spondylolisthesis is generally associated with SCI. Cervical lesions result in quadriparesis or quadriplegia. High thoracic injury results in paraparesis instead of quadriparesis. In the lower thoracic and lumbar injury, bladder and bowel symptoms dominate the clinical presentation. The degree of vertebral column injury can be accurately detected by multidetector CT, but evaluation of such cases is complete only with the additional use of MRI. MRI detects the level and grade of SCI and associated ligament injuries.

The grade of SCI may range from simple edema to complete transection. The level of transection generally corresponds to the level of spinal injury, and it results from the compression

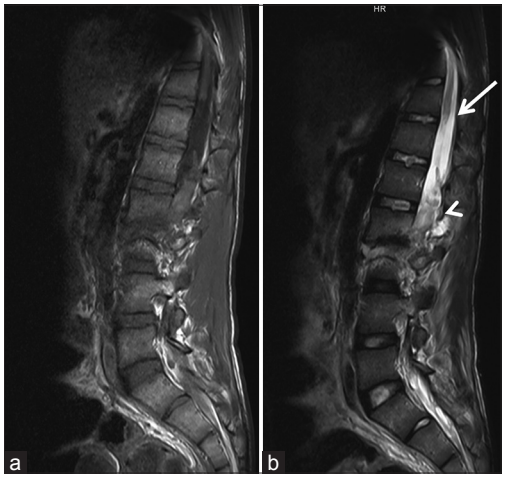

Figure 2: Sagittal T1-weighted (a) and T2-weighted (b) magnetic resonance images showing anterolisthesis of L2 over L3 with associated extensive anterior and posterior ligament disruption. The spinal cord is clearly seen to be transected at D11 vertebral level (arrow) with clumped up and thickened distal segment noted from L1 vertebral level (arrowhead). Upper dorsal spine shows distortion artifacts due to aortic stent-graft

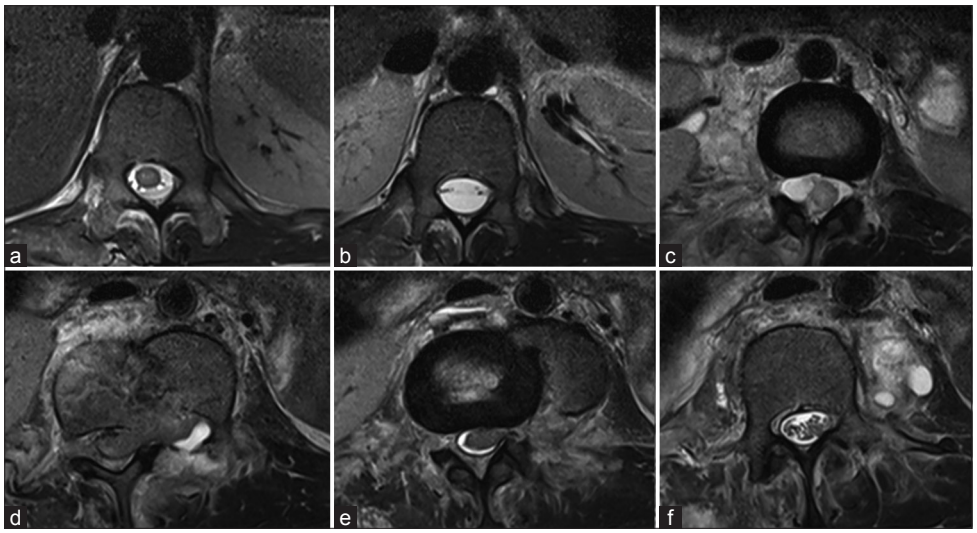

Figure 3: Serial axial T2-weighted images of the spine in a craniocaudal direction from the normal proximal cord to distal cauda equina. It is showing normal proximal dorsal cord (a) which is then disappearing at the level of transection with empty thecal sac (b). Distally the pulled down cord reappears (c) and can be seen traversing horizontally at L2-L3 level (d). Conus medullaris is lying at L3 (e) with cauda equina (f) distal to it

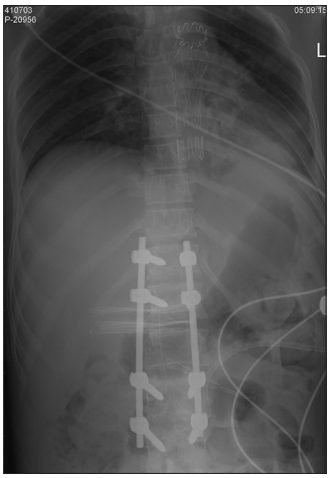

Figure 4: Posttreatment radiograph showing spinal fixation prosthesis with pedicle screws. Note also the stent graft in proximal descending aorta

due to the opposing bony walls of the spinal canal.[6] However, in our case, the cord transection was seen at a much higher level than the vertebral column injury. Spondylolisthesis was seen L2-L3 level, the location of cauda equina, and we do not see the normal cord at this level in adults. Spondylolisthesis may have resulted in stretching of the nerve roots in cauda equina, leading to transmission of the force of traction to the cord. All these factors might have led to transection of the cord in the thoracic segment [Figure 5]. As we know that the spinal cord is thinnest in the thoracic region, this may be the cause of transection at a thoracic level.

Such injuries require reduction and fixation using pedicle screws, which provide stability, good alignment, and fixation.[7,8]

Conclusion

Traumatic spondylolisthesis represents high-grade spinal injury and is commonly associated with SCI. Higher grades of spondylolisthesis may result in spinal cord transection. The level of transection generally corresponds to the level of spinal column fracture. In our case, spondylolisthesis was seen L2-L3 level, the location of cauda equina, yet the transection was at a much higher level (D11). In addition, cord was pulled

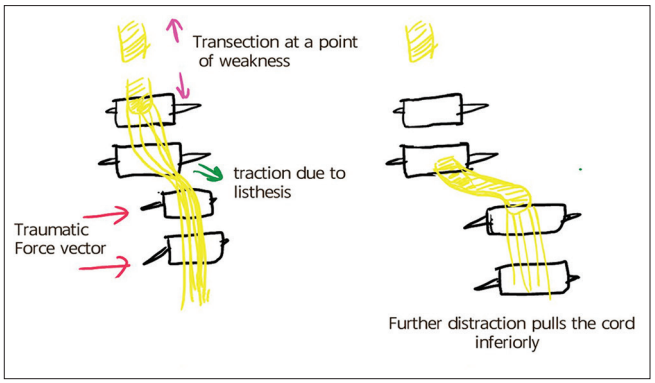

Figure 5: Schematic diagrams showing the possible mechanism of cord transection at a unexpectedly higher level

distally with conus medullaris lying at L3 level. It might have been a result of stretching of the nerve roots in cauda leading to transection of the cord in a zone of weakness.

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