

Case Report

Complete avulsion of spinal cord and cauda equina: A case report

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Abstract

Pure ligamentous flexion-distraction injuries of the lumbar spine are relatively rare and even less commonly associated with neurologic compromise. They are largely related to the use of lap belt restrains during motor vehicle accidents. We report a 19-year-old female backseat passenger wearing a lap belt who was involved in a head-on collision. On admission she was paraplegic, with a T12 sensory level and no motor and sensory function of S4-S5 (American Spinal Injury Association (ASIA) A). Plain X-ray and computerized axial tomography (CAT) spine showed a flexion-distraction injury at the L3-L4 level. During surgery in the interspinous space a conus medullaris was identified, which was completely severed from the spinal cord. The patient underwent a fusion procedure and made a good recovery. Twelve months after surgery she was able to walk with a knee-ankle-foot orthosis, she has no motor function below knees, no sensation below L2, and no voluntary bladder control. Although described type of injury is very rare, one should always have in mind devastating consequences of inadequate or improperly worn seatbelts.

Key words: Chance fracture, surgery, trauma

INTRODUCTION

Pure ligamentous flexion-distraction injury of the lumbar spine is a relatively rare clinical entity comprised of transverse disruption of the disc combined with tension splitting of posterior column. It has been first described by Chance in 1948^[1] as a result of flexion over a fulcrum positioned anterior to the spine. It is largely related to the use of lap belt restrains during motor vehicle accidents, when large forces are transmitted through the abdominal cavity often causing concomitant visceral injuries.^[2] Neurologic deficit is rare as majority of cases involve lumbar levels, below the spinal cord.

CASE REPORT

We report a 19-year-old female backseat passenger wearing a lapbelt who was involved in a head-on collision when the sport utility vehicle (SUV) she rode in fell into gully. On admission she was paraplegic, with T12 sensory level and no motor and sensory function of S4-S5 (American Spinal Injury Association (ASIA) A). Plain X-ray [Figure 1] and computerized axial tomography (CAT) spine showed a flexion-distraction injury at the L3-L4 level, with a small fragment of the L4 vertebral body avulsed [Figure 2]. After ruling out intra-abdominal injuries, patient was taken into surgery within 24 h after accident. Immediately after skin incision, large hematoma was evacuated. Further dissection of the subcutaneous tissue revealed that fascia was disrupted and within the interspinous space a neural structure with tangled nerve fibers was found [Figure 3]. On closer inspection it was identified as a conus medullaris, which was wholly severed from the spinal cord. It was removed and laminectomy was performed to attempt dural repair. Despite efforts, dura was not found as it probably recoiled into the

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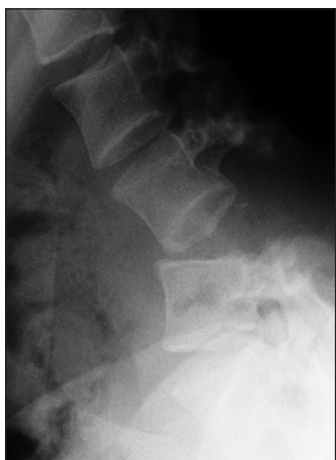


Figure 1: X-Ray taken in lateral decubitus position



Figure 2: CT showing only modest malalignment and the naked facet sign, visible in all planes (arrows). CT = Computed tomography

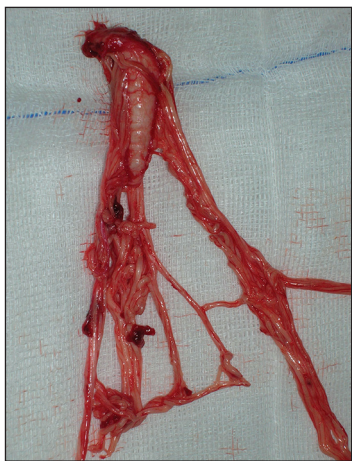


Figure 3: Avulsed conus medullaris with roots

upper portions of spinal canal as a result of injury. The laminectomy site was covered with a fibrin coated fleece. The pedicle screws were placed into L2-L5 vertebral bodies, with subsequent L3-L4 endplate preparation and implantation of an interbody spacer. Autologous bone locally procured from facet

joints mixed with synthetic bone substitute was used to fill in the interbody space. The postoperative course was complicated by formation of a large subcutaneous hematoma which developed despite placement of a wound drain. The wound was revised 3 days after initial surgery, hematoma was evacuated, and skin was closed in multiple layers. Some 7 days later, patient developed a cerebrospinal fluid (CSF) leak through the incision; it was treated with a lumbar drainage (placed at L2 level) and prolonged bed rest. Eventually the patient made a satisfactory recovery and 12 months after surgery was able to walk with a knee-ankle-foot orthosis. She had no motor function below knees, no sensation below L2, and no voluntary bladder control.

DISCUSSION

Chance type flexion-distraction injuries are rare, the incidence among entire series of thoracolumbar fractures ranges from 5^[3] to 15%.^[4] They are a consequence of the hyperflexion of the spinal column around the fulcrum placed in front of the abdomen. Typically this occurs as a result of injuries sustained while wearing the seat belt, especially the lap belt.^[2] The more anterior position of the axis of rotation, the greater distracting force acting on adjacent segments with a much lesser axial component.^[5] Flexion-distraction injuries of the spine are often accompanied by serious visceral injuries which should be ruled out in each and every case.^[2,6] Although this type of injury is considered highly unstable, neurological deficit is rare,^[5] and if present, it is usually caused by direct injury of lower thoracic to upper lumbar levels. In our case the deficit was a result of indirect injury: Most likely the avulsion of the conus medullaris was caused by the sudden deceleration with subsequent distraction and eventual failure of ligamentous elements followed by substantial traction of the conus by the nerve roots.

Recent article by Rade *et al.*, provides an elegant illustration to support this hypothesis.^[6] It was found that during the straight leg raise (SLR) test the conus descends by more than 2 mm. Moreover, the displacement is much greater with the bilateral SLR than unilateral. It is plausible to expect far greater dislocation with force acting upon nerve roots during abrupt deceleration in a restrained patient with both hips flexed.

To our knowledge there have been only a handful of similar cases reported in literature, all among children and adolescents who sustained injuries in motor vehicle accidents.^[7-11] The authors of relevant articles and reviews emphasize the violent mechanism of injury and a significant risk of intra-abdominal visceral injuries.^[7]

As the lap belts have been gradually phased out, the incidence of the type of injury described in this article is likely to decline. Nevertheless both the practitioners and the motor vehicle users should be aware of potentially dreadful consequences of inadequate or improperly worn seatbelts.

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