Traumatic lumbar Spondylolisthesis. Case Report

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Abstract
Only few cases of traumatic spondylolisthesis (from the cranial to lumbosacral joint) have been reported to date. Recovery of neurological function is dependent on the time of decompression and stabilization. We highlight the paramount importance that the time past between injury and surgical decompression have on neurological recovery and implant durability. Authors present the case of a 26 years old patient who suffered a motor crash 10 days ago before admission in our institution for cauda equina syndrome (L5 level). He also presented abdominal trauma with left kidney contusion, spleen contusion, thoracic contusion and left fibular fracture. X-ray and MRI examinations of the lumbosacral spine revealed grade 3 of spondylolistesis (60% anterior dislocation L5 - S1, intervertebral disc and posterior ligaments laceration, severe compression of the dural sac and dural laceration with CSF leakage through the posterior muscular mass). Surgery performed 14 days after the injury consisted in a posterior approach with L5 laminectomy, dural decompression and duroplasty with fascia lata, segmental reduction and stabilization with transpedicular screws, L5-S1 discectomy and anterior intervertebral grafting with two tricortical iliac crest grafts. Posterior lumbar interbody fusion was carried out using titanium screws (Solas system). Decompression, reduction with L5, S1 pedicular screw fixation, L5 – S1 disc excision and anterior intervertebral grafting with two tricortical iliac crest grafts is an appropriate surgical technique wich offer a good stabilization and fine functional recovering.

Keywords: spondylolisthesis, spinal trauma, cauda equina syndrome, dilacerated dural sac

Spondylolisthesis describes the anterior displacement of a vertebra or the vertebral column in relation to the vertebrae below. It was first described in 1782 by belgian obstetrician, Dr. Herbinaux (6), who reported a bony prominence anterior to the sacrum that obstructed the vagina of a small number of patients. The term "spondylolisthesis" was coined in 1854, from the Greek "spondyl" for vertebrae and "olisthesis" for slip. The variant "listhesis" is sometimes applied in conjunction with scoliosis. These "slips" occur most commonly in the lumbar spine.

Spondylolisthesis is officially categorized into five different types (10) by the Wiltse classification system:

I. Dysplastic,
II. Isthmic,
III. Degenerative,
IV. Traumatic, and
V. Pathologic.

The most common grading system for spondylolisthesis is the Meyerding grading system for severity of slip. The system categorizes severity based upon measurements on lateral X-ray of the distance from the posterior edge of the superior vertebral body to the posterior

edge of the adjacent inferior vertebral body. This distance is then reported as a percentage of the total superior vertebral body length:

- Grade 1 is 0–25%
- Grade 2 is 25–50%
- Grade 3 is 50–75%
- Grade 4 is 75–100%
- Over 100% is Spondyloptosis, when the vertebra completely falls off the supporting vertebra.

Traumatic lumbosacral spondylolisthesis is a very uncommon lesion. Watson-Jones described the first case in 1940 (9). Only 8 cases of traumatic spondylolisthesis (from the cranial to lumbosacral joint) have been reported to date (1, 2, 4, 8). The specific features of the lesion, as well as the different possible radiographic and clinical findings that characterize it, have encouraged many researchers to attempt to propose possible interpretations of the kinematics of the lesion.

Case Report

The case of a 26 years old patient is presented, who suffered a motor crash 10 days ago before admission in our institution for cauda equina syndrome (L5 level). He also presented abdominal trauma with left kidney contusion, spleen contusion, thoracic contusion and left fibular fracture.

X-ray showed anterolisthesis of L5 on S1 (Figure1). MRI examinations of the lumbosacral spine revealed grade 3 of spondylolistesis (60% anterior dislocation L5 - S1), intervertebral disc and posterior ligaments laceration, severe compression of the dural sac and dural laceration with CSF leakage amoung the posterior muscular mass (Figure 2).

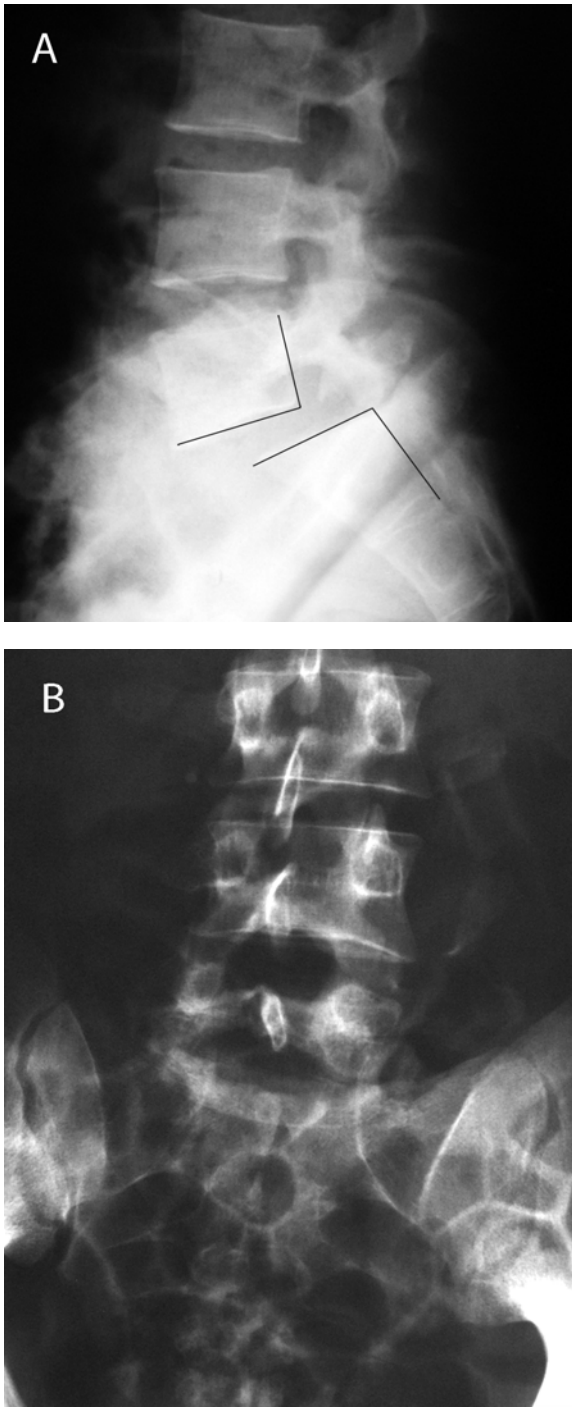

Figure 1 Preoperative X-ray showing 60% anterior dislocation L5-S1; A, lateral. B, anteroposterior

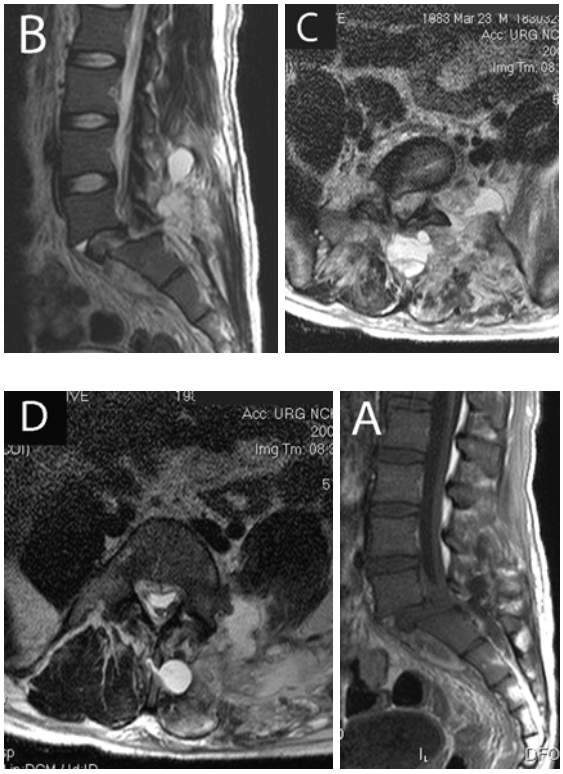

Figure 2 MRI scan. A, T1 weighted image; B, T2 weighted image; C, D. axial – T2 weighted image

Surgery performed 14 days after the injury consisted in a posterior approach with L5 laminectomy, dural decompression and duroplasty with fascia lata, segmental reduction and stabilization with transpedicular screws, L5-S1 discectomy and anterior intervertebral grafting with two tricortical iliac crest grafts (Fig. 3). Posterior lumbar interbody fusion was carried out using titanium screws (Solas system) (Fig. 4). Control radiograph was performed at 24 hours postoperative.

The patient healed without complications, with neurological status improved. He was able to walk five days after surgery without spinal instability signs. Follow-up at two months found the patient in a good status.

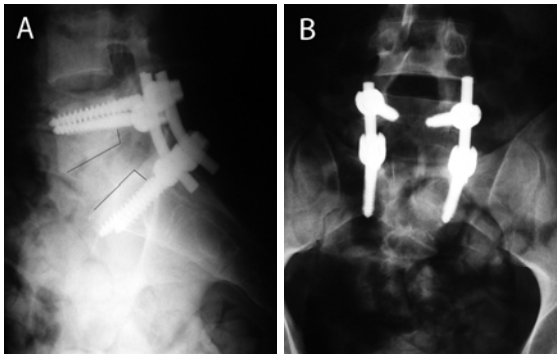

Figure 3 Postoperative X-ray. A, Anteroposterior; B, lateral

Figure 4 A

Figure 4 Solas Spine System. A, Instrument case with 3 inner trays; B, Solas lateral view; C, Poly screws Ø 6 mm: gold color, D, Poly screws Ø 7 mm: blue color

Discussion

Traumatic spondylolisthesis is a fracture of the posterior elements, rather than the pars interarticularis, leading to instability and listhesis. Only a few cases of traumatic spondylolisthesis of the lumbosacral joint have been reported. Early decompression promotes recovery of neurological function. The timing of decompression and the degree of spinal canal narrowing are the main factors affecting neurological recovery.

Different treatment modalities are proposed to treat the dislocation. Although there are some reports of successful conservative treatment, open decompression and to a certain site reduction with internal segmental fixation and fusion are the most accepted treatment modalities (7). There is no any neurological worsened case after the operation; they remained same or improved clinically at the reported cases. In the event of a traumatic disruption of the disc material, it should be excised for decompression, preferably with interbody fusion. Interbody fusion allows higher degree of stability and fusion rate. The anterior support reduces the risk of implant failure (5). It may be performed anteriorly, especially if the disc height is needed to be restored, otherwise it may be done posteriorly. In grade 2 or more, listhesis reduction should be achieved before interbody placements. Autologous bone substitute is the gold standard with or without a cage insertion. If the disc material is intact, especially with ligamentous structures, at grade 1 or 2 spondylolisthesis, the necessity of the interbody fusion may be controversial, but it is mandatory to search neural canal and bilateral foraminal compression due to a disc protrusion especially after reduction.

The facet joints do not support axial loads unless the spine is in an extension posture. Also at the lumbosacral junction, the angle of the sacrum in relation to the L5 vertebral body may substantially affect pathological processes (3).

The coronal facet orientation of L5–S1 and lumbosacral joint angle explains the

reason why traumatic spondylolisthesis occurs mostly on L5–S1 level. It may be speculated that the weakness of the tip of this patient's inferior articular process is the reason of L4–L5 traumatic spondylolisthesis.

We believe that traumatic spondylolisthesis with laminar fracture may probably be caused by an extension and axial load combination type injury. However, in traumatic spondylolisthesis without laminar fracture, hyperflexion type injury is the most likely cause. Asymmetric lesions includes rotational component. But the occurrence mechanism in each particular case will be challenging to be exactly defined, because both type of injury patterns with their subtypes may cause to similar radiological findings. Biomechanical studies may help to understand the pathogenic mechanisms.

Conclusion

Decompression, reduction with L5, S1 pedicular screw fixation, L5 – S1 disc excision and anterior intervertebral grafting with two tricortical iliac crest grafts is an appropriate surgical technique wich offer a good stabilization and fine functional recovering.

Time delay has a paramount importance in functional recovery, it means the shorter the time between injury and surgery, the greater neurological outcome.

A good understanding of the complex regional biomechanics is needed for adequate surgical approach.

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