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Case Report

Recovery after fracture dislocation of L3/L4 ASIA B: Case report

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ABSTRACT

In fracture dislocations of the lumbar region, two anatomical facts can help preserve neurological damage in patients, when compared with trauma in the cervical or thoracic region. Firstly, the spinal cord in adults extends only to the lower edge of the first lumbar vertebra, and secondly, the large vertebral space in this region gives ample space for the roots of the cauda equine. As a result, the nerve injury may be minimal, because the nerve roots in this region are accommodated in a larger area, with less content and space. This study presents the case of a 48-year-old male, a construction worker, who suffered a fall from a height of approximately 15 meters, directly hitting the lumbar region against a beam, and presenting pain and inability to move the legs. The patient was brought to the emergency room 1 hour after the accident, clinically assessed, submitted to x-rays and a CT scan, and diagnosed as having an ASIA B L3-L4 fracture dislocation. Three hours after the accident, reduction was performed via posterior transpedicular fixation. One week later, an anterior approach was performed. The patient progressed to ASIA C 24 hours after the first surgery. Three months later, the patient was functional with ASIA D and good sphincter control. The author's purpose is to show the results obtained by an intervention in the initial hours of the trauma, which helped promote the evolution from a nonfunctional injury to a functional one, with near-total recovery.

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Introduction

Due to disproportionate growth of the vertebral column during development compared with the spinal cord, the length of the roots increases progressively from the top down, so that the spinal cord does not constitute all the content of the medullary canal. Instead, the content is composed of the lumbar and sacral nerve roots from the lower edge of the first lumbar vertebra in adults, which form a strand of nerves where the filum terminale is posteriorly located. Together, these lower nerve roots are known as the cauda equine, or horse's tail.

Spinal cord injury can result in partial or complete loss of function at the level of the injury, and partial or complete loss of the function of the afferent and efferent nerve tracts below it.

The best prognosis for spinal cord injuries in the lower lumbar spine has been reported in the works of Holdsworth [1], in which paraplegia may be limited, and impingement by bruising and solid objects is of less consideration, placing the recovery in doubt, regardless of the time between the accident to surgery [1].

Reaction and axonal degeneration are the changes that occur in a nerve cell when its axon is cut or injured. The changes begin to appear 24–48 hours after the injury. The degree of changes will depend on the severity of the axonal injury and will be greater if the injury occurs close to the cell body.

A classification of injuries is needed in order to develop a common language for treatment indications. Several classification systems exist, the most common one being the Denis classification *apud* Aebi [2].

In the 1990s, the AO Group, examining the classification of spinal cord injuries, concluded that there was no comprehensive classification system available, and that the classification of Denis was the most commonly used one at that time. There was a major problem with the so-called three-column concept, namely, the central column. The central column is a virtual column and not an anatomical entity *per se*, therefore it is not suitable for use in the classification of injury types. A stable spine can withstand three main forces: axial compression force, axial distraction force, and torsion forces, with rotation around the longitudinal axis.

The broad AO classification of the thoracolumbar spine is based on more than 1400 fractures and was published in the *Journal Spine Europeo* in 1994.

The AO-spine classification is the most complete and logical classification available to date, but it has never been systematically validated. There are three different types of lesion that can be differentiated: Types A (compression), B (distraction), and C (rotation) [2].

High energy force is needed to create a complete fracture-dislocation of the lumbar spine. Reducing the dislocation is difficult due to the large forces acting on the lower lumbar spine. The purpose of surgery is to restore the anatomy through an appropriate reduction, maintain the reduction through instrumentation, reestablish sagittal balance, and promote fusion of the affected vertebrae [1–4].

Although there is one case in the literature that reports spontaneous reduction of a fracture-dislocation when carrying out imaging studies [5], there are few cases reported in the worldwide literature on recovery of neurological function after surgery, with adequate reduction of dislocations of distal segments of the lumbar region [2,3,6–9].

Antony J. Herrera et al. in Belgium, in their report of a case called single-level transforaminal fusion, concluded that in traumatic fracture dislocation, intersomatic fusion is considered an option [6].

Case report

Male 48 years old, treated at Hospital de Especialidades, Centro Medico Nacional de Occidente IMSS, who fell from about 15 meters while working as a labourer on a construction site, suffering a direct blow to the lumbar region with a blunt object. He presented acute, intense pain, with inability to move his lower limbs and loss of sensation. He was taken to the emergency department and was received in the shock room 1 hour after the injury, where he was placed on an ATLS regimen, hemodynamically stable, with a Glasgow score of 15. The loss of sensation was confirmed by fine touch to distal L3, strength of 0 for distal L3. Last functional level L2.

With no primitive reflexes or osteotendinous patellar and Achilles reflexes, the patient moved en bloc prior to immobilisation of the cervical region; the dorsolumbar region was examined to assess a large ecchymosis in the lumbar region, painful to touch, with palpable tumour. The patient was placed on NASCIS regimen due to suspected lumbar neurological injury, imaging studies, radiographs of the neck, chest and pelvis were requested, but no damage was found, when evaluated through the technique of imaging of the

Fig. 1. Lateral radiograph shows fracture dislocation of L3 / L4.

lumbar region with simple radiographs in two projections and computed axial tomography. Fracture-dislocation at L3–L4 was assessed and classified as an AO 53C3.2 fracture with ASIA B neurological injury (Figures 1–3).

Management carried out and surgical findings

Three hours after the injury, the patient was sent to the operating room for posterior reduction of L3–L4 with long posterior transpedicular screw instrumentation at L1–L2–L4–L5, bilateral rods, and crosslink system with monoaxial screw with posterior release at L3, and posterolateral fusion with autologous corticocancellous graft and bone matrix (Figure 4).

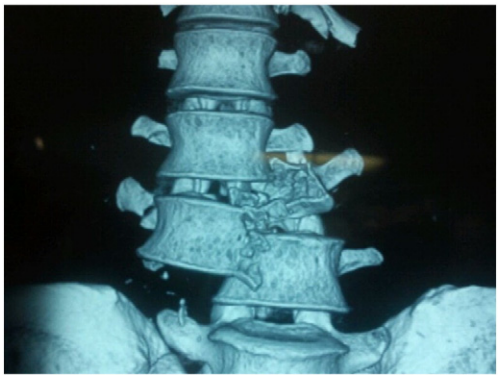

Fig. 2. 3D tomography reconstruction front view. Shows dislocation L3 / L4. fracture of the vertebral body of L3 and L4.

Fig. 3. 3D tomography reconstruction Posterior view.

During surgery, an extensive lesion of soft tissues was observed, comprising both paravertebral muscles and ligaments, dislocation of L3 on L4 with lateralisation of same, instability of the posterior elements, and hematoma in this region.

Fig. 4. Lateral radiograph. Shows posterior stabilization (2 transpedicular screws above L3 and 2 below) with reduced dislocation.

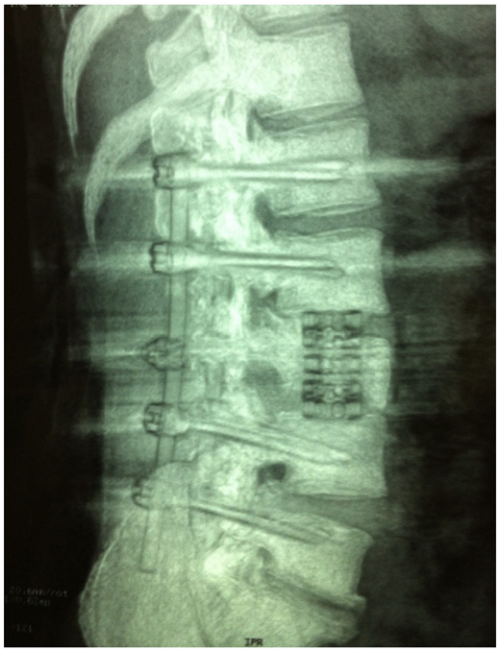

Fig. 5. Anterior stabilization. Corpectomy of L3 and placement of a vertebral replacement device.

The neural canal was examined, with finding of a lesion in the dura mater and leakage of cerebrospinal fluid, which was repaired with sutures and application of DuraGen. Roots intact, without signs of root section.

One week later, in a second surgical procedure, left-side anterolateral approach was performed, with corpectomy of L3 and placement of a vertebral replacement device. Procedure performed without incidents or accidents (Figure 5).

Postoperative evolution

Twenty-four hours after the first event, the patient was re-examined and presented primitive reflexes and return of sensation in all the dermatomes on crude touch, hypostasis of L4–L5–S1 on fine touch, complete mobility up to L3, strength of 2 for L4–L5–S1.

Nine days after the injury without sphincter control, osteotendinous, patellar, and Achilles reflexes were present. Full strength to L3, L4 of 3. L5–S1 of 3.

Outpatient was assessed at 4, 8, 12, 16, 20, and 24 weeks. At 6 months, a CT was reported in which adequate restoration of anatomy was observed, with recovery of sagittal balance, instrumentation material still in situ without loosening or signs of fatigue, and signs of posterolateral fusion.

Clinically, the patient begins walking with the help of family members, supported on the left arm, walking slowly, strength restored in all the myotomes, sensitivity preserved, and sphincter control recovered (Figure 6).

Discussion

Fractures of the lumbar vertebrae are not always accompanied by neurological deficit or instability. White and Panjabi [10] described the criteria for classifying a stable or unstable spine. There are also classifications for assessing neurological deficit and in this case, we used the ASIA scale.

Fig. 6. Outcome 6 months later. The patient begins walking.

When assessing a patient with a fracture of the lumbar region with signs of neurological instability involvement, it is essential to consider the possibility of surgical treatment, with the aim of limiting the neurological damage or its progression, being that the recovery of lost function is secondary.

In addition, goals are to provide adequate stability with restoration of sagittal balance. MacCormack et al. [11] describe criteria for performing an anterior approach, which take into account three points: percentage of collapse or fracture of the vertebral body, degree of regional kyphosis, and invasion of the neural canal by fragments.

On this occasion, of the five options described for the treatment of thoracolumbar fractures (short posterior instrumentation, long posterior instrumentation, short posterior instrumentation with anterior replacement, long instrumentation with anterior replacement, or only placement of anterior replacement), a two-stage procedure was decided on.

The lesion was classified as A0 53c3.2 with ASIA B, signifying great instability with neurological injury, which is often associated with poor outcomes after surgery and poor evolution for the patient in the long and short terms.

The aim of this case report is to show that early reduction and decompression in cases of vertebral fracture-dislocation promote recovery from the neurological problems that the patient may suffer in a case of serious injury, especially in the lumbar region, and thanks to early reduction (within 3 hours) in this case, the patient evolved from ASIA B neurological injury to ASIA D injury 3 months after surgery.

Conflict of interest

The authors, their immediate families, and any research foundation with which they are affiliated have not received any financial payments or other benefits from any commercial entity related to the subject of this article.

References

[1] R.P. Kelly, T.E. Whitesides Jr., Treatment of lumbodorsal fracture-dislocations, Eur. Spine J. 19 (Suppl. 1) (2010) S2–S7.
[2] M. Aebi, Classification of thoracolumbar fractures and dislocations, Eur. Spine J. 19 (Suppl. 1) (2010) S2–S7.
[3] B. Zarate-Kalfopulos, S. Romero-Vargas, C. Alcántara-Canseco, L.M. Rosales-Olivarez, A. Alpizar-Aguirre, A. Reyes-Sánchez, Traumatic posterior L4–L5 fracture dislocation of the lumbar spine: a case report, Global Spine J. 2 (2012) 235–238.
[4] C.T. Lim, H.T. Hee, G. Liu, Traumatic spondylolisthesis of the lumbar spine: a report of three cases, J. Orthop. Surg. (Hong Kong) 17 (3) (2009) 361–365.
[5] K.S. Lee, W.K. Bae, H.G. Bae, I.G. Yun, Natural course of spontaneously reduced lumbo-sacral fracture-dislocation–a case report, J. Korean Med. Sci. 8 (5) (1993) 390–393.
[6] A.J. Herrera, C.A. Berry, R.D. Rao, Single-level transforaminal interbody fusion for traumatic lumbosacral fracture-dislocation: a case report, Acta Orthop. Belg. 79 (1) (2008) 117–122 (2013).
[7] F.E. Deniz, M. Zileli, S. Cağli, H. Kanyilmaz, Traumatic L4-L5 spondylolisthesis: case report, Eur. Spine J. 17 (Suppl. 2) (2010) S232–S235.
[8] C.T. Hsieh, G.J. Chen, C.C. Wu, Y.H. Su, Complete fracture-dislocation of the thoracolumbar spine without paraplegia, Am. J. Emerg. Med. 26 (5) (2008) 633.e5-7.
[9] M. Chana, B. Estébanez, Complete lumbar dislocation after a car crash, Mayo Clin. Proc. 87 (8) (2012) e61.
[10] M.M. Panjabi, Clinical spinal inestability and low back pain, J. Electromyogr. Kinesiol. 13 (2003) 371–379.
[11] T. McCormack, E. Karaikovic, R.W. Gaines, The load sharing classification of spine fractures, Spine (Phila Pa 1976) 19 (15) (1994) 1741–1744.