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Herniated intervertebral disc associated with a lumbar spine dislocation as a cause of Cauda Equina syndrome: a case report

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Abstract To report a case of Cauda Equina syndrome with the completion of the paralysis after the reduction of a L4L5 dislocation due to a herniated disc. Although several articles have described a post-traumatic disc herniation in the cervical spinal canal, this is not well known in the lumbar region. A 30-year-old man was admitted to the emergency room with blunt trauma to the chest and abdomen with multiple contusions plus a dislocation of L4-L5 with an incomplete neurological injury. After an emergency open reduction and instrumentation of the dislocation, the patient developed a

complete cauda equina syndrome that has resulted from an additional compression of the dural sac by a herniated disc. In a dislocation of the lumbar spine, MRI study is mandatory to check the state of the spinal canal prior to surgical reduction. A posterior approach is sufficient for reduction of the vertebral displacement, however an intra-canal exploration for bony or disc material should be systematically done.

Keywords Cauda equine · Herniated disc · Lumbar dislocation · MRI · Reduction

Introduction

Post-traumatic disc herniation associated with dislocation of the cervical spine is a well-known entity described by several authors [1, 2, 4, 5, 7]. Their treatment has become well established to prevent catastrophic iatrogenic complications upon reduction of the fracture-dislocation. Disc herniation occurring with a traumatic dislocation of the lumbo-sacral spine has been recently reported as well as the treatment modalities [11, 12].

This study describes a L4L5 dislocation associated with an immediate neurological deficit and complicated by a deeper post-operative lower limbs paralysis. In addition, the authors discuss the management opportunities that could be offered to this kind of severe lesion.

Case report

A 30-year-old male was admitted to the hospital, following a severe injury to the chest and abdomen after a wall collapsed over him.

In the emergency room, the patient was in a state of hypovolemic shock: Blood pressure = 70/50 mm, Heart rate = 130/min. After stabilizing him hemodynamically with two units of blood, the initial clinical examination suggested the presence of blunt intra-abdominal injuries.

In the emergency room, the patient was suffering from acute respiratory failure. A chest X-ray revealed a right hemothorax, which necessitated the placement of a chest tube. The patient was also suffering from urinary retention and a distended bladder. The anal sphincter tone was normal as well as the peri-anal sensation. The

neurological examination of the lower limbs revealed a weakness of the left quadriceps quoted 3 and deeper paralysis of the right quadriceps quoted 0. The strength of the other muscles of the lower limbs was normal. There were sensory disturbances over the anterior aspect of the thighs bilaterally.

The initial X-ray revealed a L4-L5 dislocation (Fig. 1a, b). CT Scan of the abdomen and pelvis, revealed the presence of a mild liver and kidney trauma that did not require surgical treatment. The abdominal scan was insufficient in revealing the extent of injury to the neural elements at the level of the dislocation.

Because of this highly unstable lesion and the integrity of the neurological status beyond the level of the spinal injury, the patient was rushed to the operating room without any further delay, to prevent a potential catastrophic neurological complication. A pre-operative MRI was not ordered, the state of the L4L5 disc and the clearance of the canal has not been accurately assessed at that time.

The patient was placed in the prone position with supports under the iliac crests and the chest. A posterior approach of the lumbar spine was performed. Open reduction and segmental instrumentation with pedicular screws and rods (3 K spine system, Fradis, Fr) were used to stabilize the spine from L3 to L5. The insertion of the pedicular screws was controlled by fluoroscopy. At that point no attempt was made to decompress the canal. Somatosensory evoked potentials were not used during the surgical reduction of the dislocation owing to lack of material.

At the end of the operation, the patient was kept intubated and sedated because of the thoracic injury and the disturbance of the oxygen saturation in the blood.

Three days later, upon the patient regaining consciousness, we noted the presence of an incomplete

Cauda Equina syndrome. The patient developed a complete sensory and motor paralysis below L3, on the right side; a partial sensory and motor paralysis on the left side. Anal sphincter tone was lost.

An emergency lumbar Myelogram (Fig. 2) and MRI (Fig. 3) were performed. The Myelogram revealed a complete interruption of the radioopaque dye at the L4-L5 level with loss of disc height at this level. The MRI showed the presence of disc material in the canal.

The patient was returned to the operating room and a L4 laminectomy was performed. After retracting the dura, a sequestered 4×2 cm intervertebral disc, composed of annulus fibrosis and nucleus pulposus was extracted; this material was totally obstructing the canal.

There were no complications after the surgery. A right Knee-Ankle-Foot orthosis was ordered for the patient, which allowed him to walk with one crutch. He started to recover three weeks after decompression. At 2 years, the muscle strength in the lower limbs reached 4/5. Perineal sensation and sphincter function became normal.

Discussion

Post-traumatic cervical disc herniation into the spinal canal has been reported by different authors [1, 2, 7]. Eismont et al. [4] suggested an algorithm for their treatment. Their recommendation was to perform a MRI before reduction of the dislocation to eliminate a herniated disc; in which case, an anterior approach should be done first to excise the disc. Rizzolo et al. [8] in a MRI study, documented a 42% incidence of acute herniated nucleus pulposus in patients with cervical spine trauma. In their series, acute disc disruption was

Fig. 1 a AP view of the lumbo-sacral region showing a fracture-dislocation at the L4-L5 level with right displacement of the spine above L5. b Lateral view of the lumbo-sacral region showing a posterior displacement of the spine above L5.

Fig. 2 Post-operative lateral view of the lumbo-sacral region (after reduction). The hardware is in place and the Myelogram shows a complete interruption of dye at the L4-L5 level (*black arrow*)

identified in “22% of patients with intact neurologic examinations, 38% of patients with complete neurologic lesions, and 54% of patients with incomplete neurologic lesions. This reaches 80% in patients with bilateral facet dislocations, 100% with anterior cord syndromes and 47% of patients with central cord lesions”. In a myelogram study, Harrington et al. [5] have shown a 35% incidence of a disc herniation in patients with fracture-subluxation of the mid cervical spine.

Our case demonstrates that what is true for the cervical spine, could also be possible in the lumbar spine.

Other similar cases have been recently reported. Valle et al. [12] related one herniated disc in a review of four traumatic lumbo-sacral dislocation and detailed the surgical modalities for decompression, stabilization and fusion of the lumbo-sacral junction. Tohme-Noun et al. [11] reported one case of compressive postero-lateral and foraminal disc herniation associated with a lumbo-sacral traumatic dislocation and analyzed its diagnostic imaging features.

On the other hand, a major difference exists between the cervical and lumbar region. At the cervical level, the existence of the spinal cord prohibits the exploration of the peridural space if a posterior approach is used. This

Fig. 3 Post-operative MRI of the lumbo-sacral region (after reduction) showing loss of disc height in the L4-L5 space, a high signal intensity on T2 sequence in the intervertebral space and a herniated disc sequestered in the canal (*white arrow*)

is why a double approach is recommended whenever a herniated disc is present in the canal.

In the lumbar region, below L1, we believe that the presence of the cauda equina permits the exploration of the entire canal, posteriorly and anteriorly; this is why, the posterior approach is sufficient to decompress the canal if herniated discal material exists.

Imaging studies, as MRI and CT scan, are mandatory to check the state of the spinal canal before proceeding to surgical reduction of the dislocation. In fact, a bony fragment or a disc rupture could be inadvertently propelled against the dura during the reduction maneuver, causing serious neurological injuries. This event could partially explain the clinical worsening of our patient. Indeed, the multiple procedures in the hospital before surgery and positioning of the patient on the operative frame might also be responsible for a part of the damage in this highly unstable three-columns spinal disruption. During surgical reduction, it is advisable to explore the lumbar canal throughout the procedure to insure the lack of dural compression by disc or bony fragments in the end of surgery. Some authors proposed [3, 6, 9] intra-operative ultrasound guidance to evaluate reduction of spinal fractures and to monitor repositioning of the narrowing fragments during the posterior approach. They concluded that intra-

operative ultrasonography is a safe and accurate method, easy to repeat and avoids the disadvantages and pitfalls of intra-operative myelography [3, 10].

Consequently, both the lack of an accurate imaging study prior to surgery and the attempt of a closed reduction of the dislocation, without intra-operative control, do not allow us to claim that surgically induced disc herniation is the only mechanism for the Cauda Equina syndrome in our patient.

To conclude, our recommendations in such cases of lumbar dislocation are:

- Intra-canal exploration should be performed systematically just before and during reduction maneuvers to control the clearance of the canal. An intra-operative ultrasound could be helpful to eliminate hidden obstruction after the reduction.
- A pre operative MRI exam, when available, is helpful to study the soft tissue lesions especially intervertebral disc extrusions and should be carried out in all patients even though the exploration of the canal is systematic.

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