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Case Report

A Rare Presentation of Bilateral Lumbosacral Dislocation with Fracture of the Sacrum – Comprehensive Literature Review

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Abstract

Introduction: The lumbar vertebrae facet joint dislocation is typically brought on by high-energy trauma. There is a paucity of literature on the dislocation of Lumbar vertebrae, with most published studies being infrequent case reports. Compared to the cervical spine, the lumbar spine's facet joints are more coronal in orientation, the coronal position increases stability and restricts the range of motion, which lowers the risk of dislocation. Additional stability is provided to the lumbar spine by huge, robust muscles and robust ligaments. These features cumulatively reduce the likelihood of dislocation

Case Presentation: A 25-year-old male presented to the emergency room following a motor vehicle accident (MVA). An evaluation revealed bilateral L5-S1dislocation, Femur shaft closed fracture, Sacral fracture along with bilateral superior Pubic rami fractures. Owing to the injury's intricacy, a staged surgery was planned. Emergency surgery was performed on the day of admission involving the debridement and repair of the perianal wound along with closed intramedullary nailing of the Femur. On the second post-operative day, the second procedure was performed: percutaneous fixation of the Sacrum followed by posterior decompression of L5-S1, extraction of the sequestered disc, posterior stabilization of L4 to S1 + S2 AI screws, and interbody fusion of L5-S1 along with autologous bone grafting (using the decompressed bone) for 360-fusion using the posterior only approach.

Conclusion: Bilateral facet dislocation of the L5-S1 is a rare injury, and therefore worth reporting. Multidisciplinary approach, timely diagnosis, can lead to successful management of such complicated injuries.

Keywords: *Lumbar Dislocation, Traumatic Spine Injury, Sacrum Fracture, Interbody Fusion, Spinal Stabilization.*

Introduction

Traumatic injuries of the lower back (Lumbo-sacral spine) leading to a dislocation or a fracture-dislocation are rare. Lumbosacral dislocations may occur secondary to traumatic spondylolisthesis (slippage of one vertebra with respect to underlying vertebrae) that may occur at the lumbosacral junction. [1] Anterior slippage is known as anterolisthesis, while posterior slippage is called retrolisthesis. [2] It is further graded according to the degree of slippage. Along with Sacral fractures, Lumbo-sacral dislocations make up only 1% of all spinal injuries. [3, 4] Traumatic lumbosacral dislocations are caused by high-impact collisions or high-energy trauma, with the patient usually being a pedestrian or driver. [5]

Compared to the cervical spine, the lumbar spine's facet joints are more coronal in orientation. In the lumbar spine, the coronal position increases stability and restricts range of motion, which lowers the risk of dislocation. [6] Additional stability is provided to the lumbar spine by huge, robust muscles and robust ligaments. These features cumulatively reduce the likelihood of dislocation. The intervertebral discs are thicker and narrower in the Lumbar spine, which offers more stability, whereas the cervical spine, on the other hand, has thinner and more flexible discs, which improve its movement but also make it more prone to accidents like dislocations. [7]

Case Presentation

A 25-year-old male with no known comorbidities presented to the emergency room following a motor vehicle accident (MVA). The patient was a motorcyclist hit by a speeding truck from behind. Upon arrival, the patient presented in a state of intoxication with a history of consumption of large amounts of alcohol but was otherwise well-oriented to time, place, and person. The patient was managed along the lines of the ATLS protocol. A physical examination revealed facial injuries, including left periorbital swelling and a laceration over the right side of the chin. A right thigh deformity was also noted, along with a peri-anal laceration (3×4 cm). Spinal tenderness was positive in the lumbo-sacral region, due to his hostile inebriate condition rest of the examination was incomplete but was otherwise hemodynamically stable.

Trauma protocol images showed: right Femur shaft closed fracture (Fig 1), Sacral fracture along with bilateral superior Pubic rami fractures (Fig 2), and bilateral L5-S1dislocation (Fig 3a and 3b). Initial Brain (CT) imaging, CT scan whole abdomen with triple contrast were unremarkable. Magnetic resonance imaging (MRI) of the lumbosacral spine revealed bilateral facet dislocation at the L5-S1 level, accompanied by fractures of the sacrum (Fig 7 and 8). Computed tomography (CT) scans of the Lumbo-sacral spine confirmed Sacral fractures involving Denis zones 1 and 2 (Fig 4 and 5) and L5-S1 dislocation with locked facet joints (Fig 6).

Figure 1. *Plain radiograph of the right Femur demonstrating Femoral shaft fracture.*

Figure 2. *Plain radiograph of the Pelvis AP view demonstrating Sacral and bilateral Pubic Rami Fractures.*

Figure 3a. *Plain radiograph of the Lumbosacral spine AP view demonstrating irregularity at L5-S1 disc space.* ***3b.*** *Plain radiograph of the Lumbosacral spine lateral view demonstrating dislocation of L5 -S1 with grade-III spondylolisthesis and L5 spinous process fracture.*

Showing a bilateral facet dislocation type-I according to "Traumatic lumbar spondylolisthesis classification based on anatomic injury (Dimar JR 2nd)"

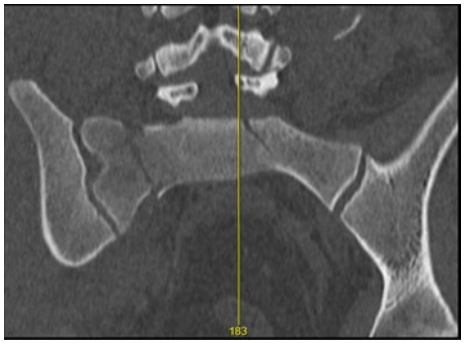

Figure 4. *CT scan lumbo-sacral spine coronal view demonstrating sacral fractures.*

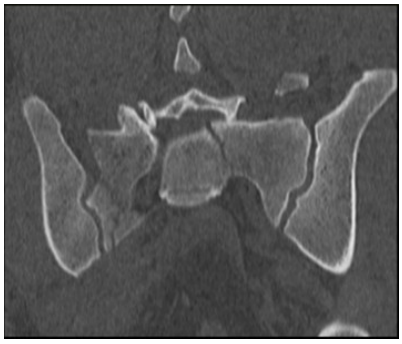

Figure 5. *CT Scan Lumbo-sacral spine coronal view demonstrating the sacrum fracture in Denis Zones 1 and Zone 2.*

Figure 6. *CT scan Lumbo-sacral spine sagittal view showing L5-S1 dislocation with locked facet joint and Sacral fracture extending into the Sacral foramen.*

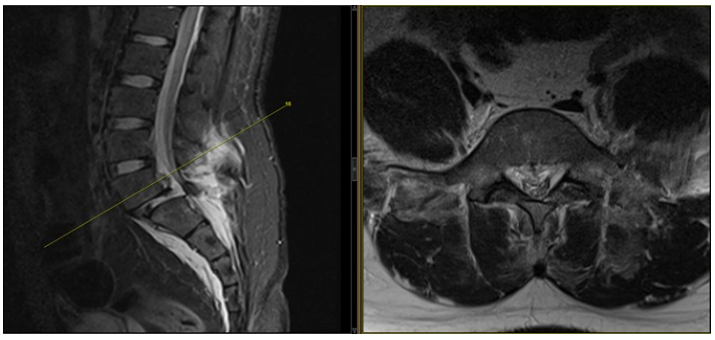

Figure 7. *MRI T2 weighted sagittal and axial views demonstrating a 3-column injury and the L5-S1 disc sequestered and cranially displaced (lying behind the L5 vertebra) causing stenosis of the Cauda Equina.*

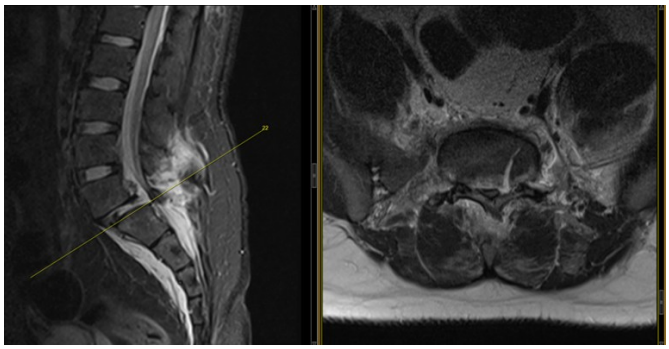

Figure 8. *MRI T2 weighted sagittal and axial views demonstrating a 3-column injury and the L5-S1 dislocation with spondylolisthesis exerting significant pressure at the level of Cauda Equina plus S1 body fracture.*

Owing to the injury's intricacy, a staged surgery was planned. An emergency surgery was performed on the day of admission involving the debridement of the contaminated perianal wound along with a closed intramedullary nailing of the Femur. Initially, he was graded as ASIA-E and then a post-operative neurological examination of the right lower limb revealed a motor grading of L4 (Ankle dorsiflexion) as 3/5 and L5 (right big toe extension) as 1/5 (bearing in mind the intoxicated state of the patient pre-operatively, which hindered an adequate initial physical examination); after which ASIA scale was changed to ASIA-D and rest of the examination was unremarkable.

On the second post-operative day, the second procedure was performed: percutaneous fixation of the Sacrum followed by posterior decompression of L5-S1, extraction of the sequestered disc, posterior stabilization of L4 to S1 + S2 AI screws, and interbody fusion of L5-S1 along with autologous bone grafting (using the decompressed bone) for 360-fusion using the posterior only approach (Fig 9 & 10).

Figure 9. *Postoperative plain radiograph AP view of Lumbo-sacral spine demonstrating Posterior Spinal Instrumentation from L4 to S1+S2 AI screws with percutaneous cannulated screw fixation of the Sacrum along with Bone grafting + Right Femur nailing.*

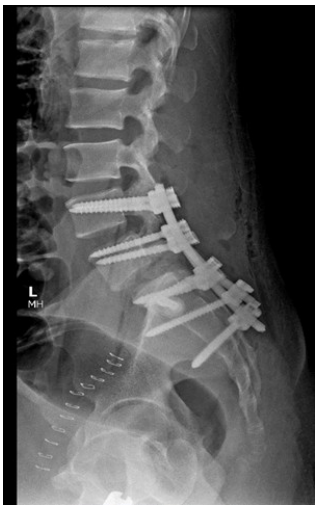

Figure 10. *Postoperative plain radiograph lateral view of Lumbo-sacral spine demonstrating Posterior Spinal Instrumentation from L4 to S1+S2 AI screws with percutaneous canulated screw fixation of the Sacrum plus L5-S1 interbody fusion using bone graft, which can be seen to be used in L5-S1 disc space along with reduction of the spondylolisthesis at L5-S1.*

Postoperative Course

After surgery, the patient's neurological impairments showed signs of gradual recovery from a motor grading of L5 from 1/5 to 2/5. L4 motor grading remained the same at 3/5 at a 2-week follow-up, showing some lower limb motor function restored. The adequate alignment of the fractures and the stability of the spinal fixation will be monitored at subsequent follow-ups. The patient is undergoing a tailored rehabilitation program. The wounds are healing, with no notable surgical site infection yet.

Follow-up

At the 14-month follow-up, the patient had near complete neurological recovery with a motor grading of 5/5 for L4 and 4/5 for L5 never roots, which were 3/5 and 1/5 respectively at the time of injury. The peri-anal and surgical wounds had completely healed with good scarring. Figures 11, 12 & 13 are the plain radiographs of the Lumbosacral spine at 14-month follow-up.

Figure 11. *Plain radiograph of the Lumbosacral spine AP view demonstrating Implant in-situ (14-month follow-up).*

Figure 12. *Plain radiograph lateral view of lumbosacral spine demonstrating Posterior Stabilization with implants in situ with no signs or loosening at 14-month follow-up.*

Figure 13. *Postoperative plain radiograph Cone view (14-month follow-up).*

Discussion

Dislocation of the Lumbosacral joint is a rare injury, and therefore, only a handful of cases can be found in the literature since their first documentation by Watson-Jones. [1] In 1940, the first reported case of a L4-L5 traumatic Spondylolisthesis suggested hyperextension as the mechanism of injury. In our case, the causative mechanism was a combination of hyperflexion and distraction, along with shear forces. [1, 3, 5] Bilateral dislocation of the Lumbo-sacral joint secondary to trauma is very rare, with only 10 cases reported in the literature up until 2011 but after an extensive literature review of a total of 81 cases of Lumbosacral joint dislocation were documented out of which 62 (77%) were male and 19 (23%) were female. [8-36] The youngest patient to be reported in the literature was a 5 years old boy who was hit by a rocking chair suffering a L5-S1 dislocation without any fracture. He was reported to have neurological deficit at L5 and S1 levels, and was treated non-operatively with traction and placed in a Cotrel traction table for hyperextension, and then immobilized with a lumbar plaster jacket. [19] The oldest patient with lumbosacral dislocation reported was a 52 years old male with L5-S1 dislocation, treated with surgical stabilization. [37]

Boger D.C. et al, [11] reported to have a unilateral facet dislocation of the L5-S1 with an associating peri-anal injury which was similar to that of our patient, except that our patient had an associated Sacral and Femur fractures along with a bilateral Facet joint lock.

About 38 reported cases of Lumbo-sacral dislocation had an associated transverse process fracture. [19, 21-24, 32,34-40] A study done in Tokyo, Japan, reported that fractures and dislocations of the Lumbo-sacral joint are a rare occurrence; however, the occurrence of this, along with bilateral locking of the Facets, is even rarer [9]. The patient in our case suffered from locking of the Facet joints with associated Sacral body and ala fractures. About 13 cases were reported to have L5S1 disc which was also present in our patient (Image 7). [11, 21, 24, 26, 48-50, 51]

According to the Roy-Camille classification, type I fractures only exhibit kyphotic angulation; type II fractures display retrolisthesis in addition to kyphosis; type III fractures show full anterolisthesis; and type IV fractures are distinguished by significant S1 body comminution [16]. Fractures of the Sacrum occur less frequently, but when they do, they are usually the result of a high-impact MVA. [8] In our case, however, we had a grade IV fracture of the sacrum along with a L5-S1 dislocation. Our patient presented with a type IV fracture.

In terms of Sacral fracture, Dennis described that Zone-I fracture affects the sacral ala lateral to the foramina, Zone-II fracture occurs at the level of the foramina, and Zone-III fracture affects the sacral canal medial to the neural foramina (Fig 14). [17] The sacral fracture pattern of our patient was involving both zone I and II (Images 4,5 & 6). Deniz FE et al. reported a case of L4–L5 traumatic spondylolisthesis with anterior slipping known as anterolisthesis, just like our case. [15]

Ver MLP et al., in their systemic review and case series, reported a patient with similar injuries (L5-S1 dislocation plus Sacral fracture with associated Scapular fracture) and proceeded with L5-S1 stabilisation plus interbody fusion and a Sacral fracture screw fixation [12]. Aihara et al. recommended posterior reduction followed by stabilization with pedicle screws and anterior lumbar fusion. [20] Similar to our case, where we decompressed the spine after pedicle screw fixation from L4 to S1 along with S2-AI screws for better stabilisation plus interbody fusion of L5-S1. S2AI screws along with interbody fusion can perhaps be considered for better stability for associated Sacral fractures.

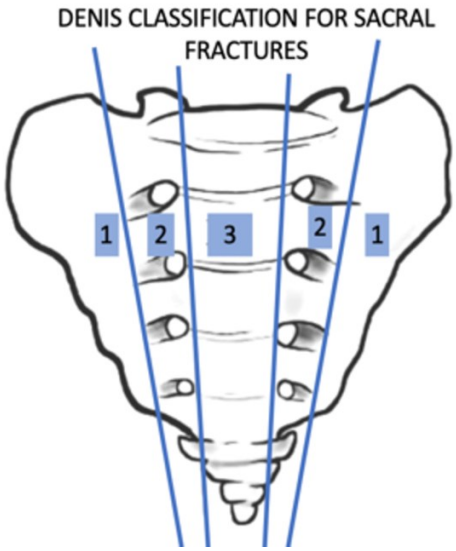

Figure 14. *Denis Classification of Sacral Fractures.*

Conclusion

Bilateral facet dislocation of the L5-S1 vertebrae combined with Femur and Sacrum fractures is undoubtedly a rare injury. Successful management requires a timely diagnosis, a multidisciplinary approach, and effective post-operative rehabilitation. This instance emphasises how important it is for medical experts to work together to treat a severe case of spinal injury and provide the best possible treatment.

Conflict of Interest

The authors have declared that no competing interests exist.

Patient Consent

Informed and written consent was obtained from the patient for publication of the case and images while maintaining anonymity. A copy of the consent is available in case required by the journal editor.

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