

Case Report

Traumatic sacralization of L5 vertebra with severe extension type spinopelvic dissociation: A case report

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ABSTRACT

Background: Spinopelvic dissociation is considered a very complex orthopedic injury. The presence of intrapelvic displacement and L5 traumatic sacralization makes our report a very rare presentation.

The case: A 60-year-old gentleman presented with a rare traumatic fracture dislocation of the lumbosacral complex with intrapelvic displacement and L5 sacralization; treated with two surgical stages: 1) pelvic external fixation and posterior pelvic tension band plate, and 2) T10 to pelvis posterior fixation.

Conclusion: Intrapelvic displacement of S1 in the presence of spinopelvic dissociation is very rare injury that requires high mechanism of injury, surgical management is important to improve functional outcome.

Introduction

Complex lumbosacral injuries result usually from high-energy injury mechanisms. The lumbosacral area has numerous osteoligamentous surrounding structures that protect the major neural elements that regulate lower extremity function [1]. Dislocation of the lumbosacral joint of L5-S1 anteriorly represents a rare and unusual form of injury especially with L5 displaced to a degree where it can be traumatically sacralized. Complete anterior lumbosacral fracture dislocation represents the most severe type of such injuries. Moreover, in the presence of traumatic L5 sacralization, only 1 case sustaining such injuries has been published in the literature [2]. We are presenting a unique case of an elderly man with severe extension type spinopelvic dissociation resulting in severe vertical shear and sacralization of L5 with intrapelvic S1 body displacement.

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¹ Contribution: surgical team member, manuscript editing and revision.

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⁴ Contribution: primary surgeon who treated the patient, manuscript writing.



Fig. 1. Anteroposterior pelvis x-ray upon arrival showing anterior pelvic ring disruption and shearing of the lumbosacral junction.

The case

A Sixty-year-old male known case of depression, presented after he fell from 8 m attempting suicide, diagnosed with severe injuries including abdomen, multiple spine fractures and right tibia fracture. He was transferred to our hospital twenty days post trauma for further management.

Upon presentation to our hospital, he was intubated and thus his neurological status could not be assessed. However, a neurological deficit bilaterally was described by the previous hospital records, this deficit included L4 and below. His initial X-rays showed pelvic vertical shear type of injury ([Fig. 1](#)). Further investigations and images involved spine and pelvis computed tomography scans ([Fig. 2a,b&c](#)) in which we identified a severe extension type spinopelvic dissociation with fracture dislocation of L4, L5 and S1 with spinal pelvic dissociation, displacement of the L5 vertebral body to a sacralization position and intrapelvic displacement of S1 Body. Multiple fractures were also found including chance fracture of thoracic vertebra (T12) and right tibia fracture.

During his early course in our hospital, he underwent Hartmann procedure by general surgery, and application of bilateral skeletal traction to prevent further displacement of the pelvis. After 1 week from his admission, he underwent application of pelvic external fixator (using supraacetabular pins) and percutaneous insertion of posterior tension band plating of the pelvis. Then, a week later, spinopelvic fixation (which we are describing in the report) was done as second stage.

Management strategy

Our strategy was to restore the pelvic ring by anteriorly supporting the pelvis with temporarily external fixator, and posteriorly by tension band plating, followed by reconstructing the spine to the pelvis; extending the spinopelvic fixation to T10 was because of the T12 unstable fracture. Since there was no active spinal stenosis, the late presentation and the mechanism being vertical shear, we elected not to do any decompression since the patient is experiencing permanent neurological deficient. For the same reasons and with presence of multiple abdominal surgeries, a reduction of L5 and S1 to their original position was not performed; which would put the patient at high risk of complications, including bleeding; taking in account that attempting reduction will necessitate an anterior approach.

Stage 1 surgical technique

In supine position and under the guidance of the C-arm, supra-acetabular external fixator was inserted in the left and right sides in order to close the symphysis pubis. After that, patient was flipped into prone position; a longitudinal incision on the paraspinal area on both sides, right and left was used; about 3-cm in length. We left off the gluteus maximus muscle of the outer surface of the ilium in both sides. A 11-hole 4.5 plate was used which we contoured and passed in a posterior aspect of the pelvis from the ilium on the right side to the ilium on the left side with two screws inserted in both iliac wings ([Fig. 3](#)).

Stage 2 surgical technique

Posterior midline approach to the thoracolumbosacral spine was used. The exposure was done from T10 to the pelvis distally

bilaterally and the level was confirmed under x-ray guidance.

Then pedicle screws were inserted with the appropriate size and length T10 bilateral, T11 bilateral, L1 bilateral, L2 bilateral, L3 bilateral, left L4 and bilateral S2 AI (alar-iliac) screws. No spinal canal decompression was done. Finally, we inserted two rods and they were secured to the pedicle screws and set screws bilaterally. We did not attempt reduction, and L5 was fixed in a position of sacralization.

Follow up

Our patient recovered from his postoperative course in stable condition. He was rehabilitated in our hospital with the help of our

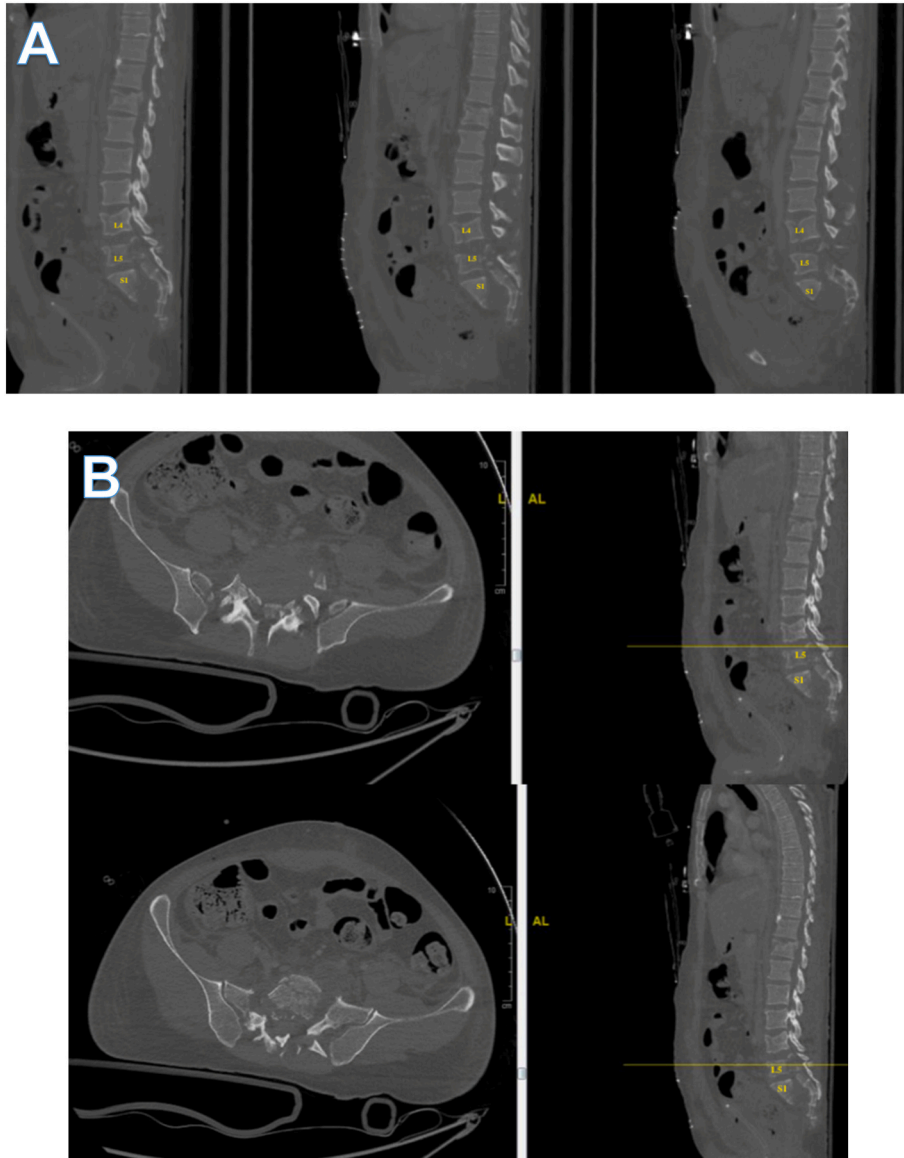


Fig. 2. A: Computed tomography (CT) Sagittal cuts upon presentation, showing traumatic L5 sacralization.

B: Axial cuts at the level of L5, showing severely comminuted fractures at the lumbosacral area.

C: Coronal cut of CT upon presentation, showing traumatic L5 sacralization.



Fig. 2. (continued)



Fig. 3. 3D CT reconstruction showing the pelvis between stage 1 and 2.

psychiatrists and physiatrists. The pelvic external fixator was removed at 6 weeks interval from our spinopelvic fixation. Post-operative neurological assessment revealed he had bilateral feet drop and dysfunction of bowel and bladder. He was able to mobilize bed to chair soon after his surgery. His rehabilitation program was discouraged by his mental status and depression.

Post operation X-rays are shown in Fig. 4a and b. Routine follow up of the patient was unremarkable, with uneventful healing of his surgical wounds and persistence of the neurological deficit. At his two years follow up visit, he was pain free, he has improvement of the left foot neurological function, he is on permanent Foley's catheter and permanent Ileostomy. The X-rays showing stable constructs (Fig. 5); we performed CT scan at that time to assess the fusion process, and a bony union was confirmed (Fig. 6a and b).

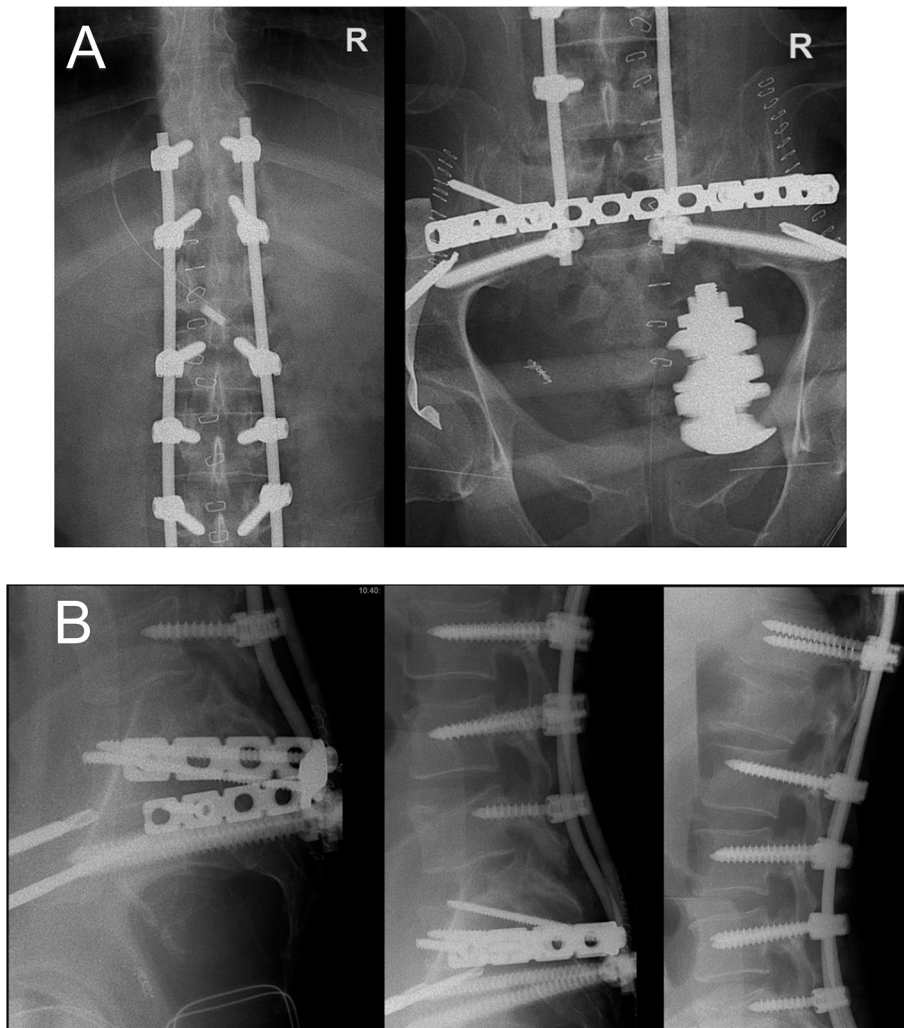


Fig. 4. A: Immediate post op AP view of the spinopelvic fixation.
B: Immediate post op Lateral view of the spinopelvic fixation.

Discussion

Sacral fractures and lumbosacral dissociation are serious injuries that result in tremendous instability and a high rate of neurologic deficit in the majority of cases [3]. The gold standard treatment consists of posterior spinopelvic fixation - with or without decompression - and anterior pelvic stabilization [3]. Early surgical treatment for such injuries reduces complications related to immobilization and improves patient quality of life. In our case the main goal of surgery was restoring the spinopelvic stability, which is an important factor in the patient's seat positioning and pain management. Many challenges were faced in managing his injury; including the delayed presentation, severe vertical shear pelvic fracture, abdominal injury, and his neurological and mental status.

The first classification of lumbosacral dislocation injuries was described by Roy-Camille and his colleagues [4] where he detailed his experience with a retrospective review of 13 patients sustaining a transverse fracture of the upper sacrum, as well as a cadaveric experiment, to establish a radiological classification based on the lumbar spine position during injury. Our patient had the most severe type of Roy's classification, in addition to that, he was found to have traumatic L5 sacralization, which we described as L5 was displaced to S1 position, and intra pelvic displacement of the body of S1 as a floating segment. The decision of not reducing the displaced L5 was due to delayed presentation (> 3 weeks) and the presence of complete neurological deficit at the time of surgery. In addition, we anticipated more surgical complications if reduction was attempted by anterior approach.



Fig. 5. AP and Lateral views of the spinopelvic fixation at 2 years follow up.

Upon reviewing the literature, we were able to find only one case where the patient had a traumatic anterior lumbosacral dissociation with L5 sacralization. However, Xuhua Lu and his colleagues presented a different kind of injury. Their patient was younger with different mechanism of injury; the dissociation was without associated pelvic fractures and without sacropelvic dissociation. Their technique involved decompression, reduction of the dislocation and L3 to L5 posterior fixation in addition to iliac screws [2].

In regard to the mechanism of injury, Nonne et al. [3] reported a case series of 5 patients who had similar mechanism of injury as our patient; however, there was no traumatic L5 sacralization. The fractures were classified as type III and VI as per Roy's classification, with all of the patients experiencing severe neurological deficit; only two patients had definitive management with spinopelvic fixation. Taking in account the rare form of injury, in 2018, Chou and his colleagues [5] reviewed retrospectively 18 reported cases in the literature. They were able to formulate an algorithm for managing spinopelvic dissociation based on Roy's classification; however, the authors of each individual report had different surgical techniques in terms of reduction, implant, and decompression.

Our surgical technique involved fixation of thoracic spine up to the pelvis with addition of posterior pelvic fixation. We believe such surgical management was necessary in order to provide more stability to the spinopelvic construct. Many surgical techniques were described, Carlson et al. [6] in 1991 described two cases where he used different techniques, including, anterior inter-body fusion with posterior instrumentation from L3 to S1 for the first case; and he used for the second case posterior fixation of L4 to S1 in addition to intra-sacral rods. However, both cases were managed early, and reduction was successful due to less severe fractures and displacement. Recently in 2015, Yazdi and his colleagues [7] reported a complex fracture dislocation of L4, L5, and S1 (traumatic spondylolisthesis with intrapelvic displacement). They attempted decompression since their patient had only unilateral L5 nerve root injury, and fusion was done through a spinopelvic fixation, their follow up showed excellent results with the patient being able to walk pain free at 2 years follow up.

Conclusion

Traumatic spinopelvic dissociation is a rare, high-energy injury. The extension type spinopelvic dissociation is the rarest form. Classification and treatment for such complex injuries is highly debated [1,8]. However, Early surgical stabilization is necessary to expedite patient mobilization and for optimal patient outcome.

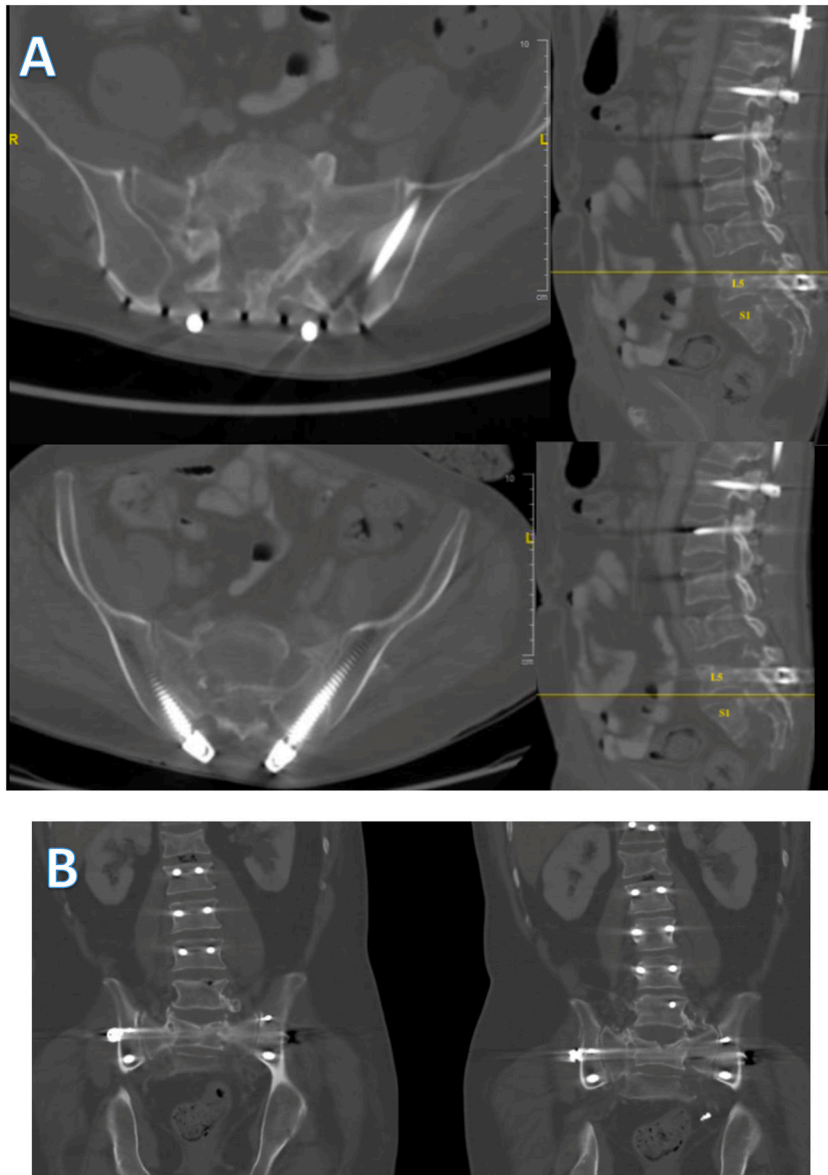


Fig. 6. A: Sagittal and axial cuts at 2 years, showing bony union with L5 sacralization.

B: Coronal cuts at 2 years, showing bony union with L5 sacralization.

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