

Review Article

Successful Management by Only Posterior Approach of a L4 Fracture with Complete Obliteration of the Spinal Canal: A Case Report in a Patient with 8 Years Follow-Up

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Abstract

The surgical treatment of the burst fracture of the lumbar spine is controversial. There is not established evidence regarding the type of the surgical planning and approach. Herein, we present a case of a 28-year-old gentleman involved in an RTA, who sustained a burst fracture of L4 with more than 90% canal compromise. He had a significant neurological deficit in both lower limbs, involving bilateral L4, L5 and S1 nerve roots, associated with partial loss of sensation and power.

The patient had sacral sparing with well-preserved perineal sensation. Considering significant neurological deficit there were 2 options to treat his fracture were available:

1. Anterior surgery, removal the retro pulsed fragment, restoration of anterior column with implant followed by posterior screw fixation.
2. Posterior surgery only, decompression and spinal stabilization.

The posterior surgery was performed with satisfactory results.

Keywords: L4 Fracture; Spinal canal; Thoracolumbar junction; Spinal cord injury

Introduction

Almost 90% of spinal fractures occur at the thoracolumbar junction, a transitional area between the rigid thoracic spine and more mobile lumbar spine [1]. On the other hand, lumbar fractures below L2 are rare, accounting for 1.2% of spinal fractures [2]. This is attributed to its location below the pelvic brim, the apex of the lumbar lordosis allowing the body's center of gravity to fall posterior to the vertebral axis, and the stabilizing effect of the iliolumbar ligaments [3].

Despite the spinal canal being widest in the lower lumbar region, a compression caused by retro pulsed fragments at that area could result in an injury to the cauda equine as opposed to the conus [4]. Progressive neurological deterioration in the presence of substantial canal compromise is an indication for surgical decompression in addition to mechanical stabilization. If surgical treatment aiming for stability, restoration of spinal balance and weight-bearing ability is

chosen, further debate arises over the appropriate type of approach to treat the fracture through the anterior or posterior approach. Scientific evidence is lacking for the superiority of one surgical technique over the other in view of morbidity [5,6].

On the other hand, vertebrectomy, decompression and reconstruction of anterior column are preferred method of treatment in burst fractures with neurological deficit [7]. However, the anterior approach is not always applicable because of the potential complications and the associated morbidity in patients with other significant injuries especially in polytrauma settings [8].

In this report, we present a case of 28-year-old gentleman presenting with severe neurologic deficit following a burst L4 fracture. The patient was treated successfully via a posterior-only approach. We discuss the reasons behind deciding on such an approach with technical notes.

Materials and Methods

A 28-year-old patient was admitted to the major trauma unit after a road traffic collision with estimated speed of 90mph. Initial screening demonstrated severe neurological deficit in both lower limbs involving bilateral L4, L5 and S1 nerve roots, Medical Research Council (MRC) grades 1/5 associated with loss of sensation [9]. The patient had sacral sparing with well-preserved perineal sensation and tone.

International Standards for Neurological Classification of Spinal Cord Injury (ISNCSCI) was used to identify the ASIA Impairment Scale (AIS) and neurological level and was classified as ASIAB [10]. CT of the spine demonstrated a complete burst fracture of L3 vertebral body classified as A3 Type, according to AO Spine Thoracolumbar Injury Classification System [11]. The posterior superior fragment

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was retro-pulsed significantly, causing more than 90% obliteration of the lumbar spinal canal (Figure 1).

Due to the neurologic damage, decision was made for an early surgical intervention without doing any additional imaging like MRI, in order to avoid delays. Surgery was carried within 12 hours from presentation. A posterior technique applying features of Pedicle Subtraction Osteotomy (PSO) in order to get a safe access to the retro-pulsed fragment without causing any further neurologic damage was performed. The Patient was positioned prone on a Montreal mattress and after central decompression of the posterior elements including L4 laminae, transverse processes and a part of L4/5 and L3/4 facet joints were completely excised. Pilot holes were made in the pedicles and one third of the proximal pedicles were removed, creating a safe access to the posterior aspect of the dura and retro-pulsed fragments.

The fragments from both sides were fully exposed by gentle retraction of the dura, and a posterior wall impact or punch was used to push the protruding fragments back into the posterior vertebral body. This manoeuvre was performed several times with great care from both sides to ensure that there is no further compression on the dura and neural elements. When the decompression was completed, posterolateral stabilization was done using a 7 mm diameter screws and pre-contoured cobalt chrome rods (Figure 2). Decortication of the transverse processes was performed and a combination of local bone graft from the decompression and synthetic bone graft substitute was laid on both paravertebral gutters. Wound was closed under superficial and deep drains. No complications were encountered



Figure 1: An image showing the hydatid cyst of the appendix, the red arrow shows the cyst, and the blue arrow shows the appendix.

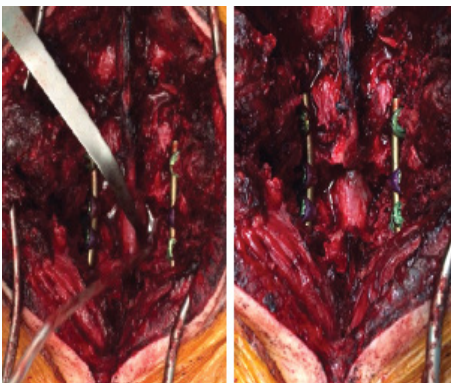


Figure 2: Intra-op & post-op images show short segment pedicle screw fixation from L3-L5.

during the surgery. Following surgical treatment, the patient had residual drop foot on the right side, with power on the left side going back to normal. He also had normal bowel and bladder function. He underwent specialist neuro rehabilitation on the ward and was able to mobilize independently with a right ankle brace and was discharged on day 10 post operatively with no in-hospital complications. Comparison of pre and post op scans showed complete decompression and disappearance of the fragments in the canal (Figures 1 and 3).

Results

On follow up, X-rays of the lumbosacral spine, performed 6 months postoperatively, showed good position of the pedicle screws and normal alignment of the lumbar spine (Figure 4). There was no complaint of any back pain, sleep disturbances or symptoms of post-traumatic stress disorder. He was able to return to work, 3 months post injury. At his last follow-up in the Outpatient Clinic, 8 years postoperatively, the patient was independent in all his activities of daily living and a new lumbar Spine X-ray showed preservation of the normal lumbar parameters with no signs of metal work failure (Figure 5).



Figure 3: Post-op CT Scan show canal clearance, using posterior approach only.

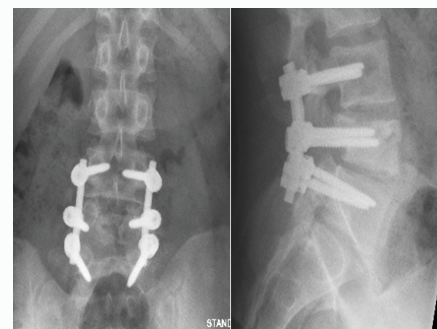


Figure 4: 8-year follow-up X-ray showing adequate alignment and a stable spine.

Discussion

This is the first report with long follow-up, on posterior direct reduction of significant retro pulsed fragment in patient who had L4 burst fracture with neurological deficit. The patient's operation was uneventful and in the following weeks showed a remarkable neurological improvement in both lower limbs leaving him with mild residual foot drop on the right side.



Figure 5: 8-year follow-up X-ray showing adequate alignment and a stable spine.

The aim of the surgical treatment is the decompression of the spinal canal and Cauda Equine in order to improve as much as possible the neurological compromise and the stabilization of the spine, in order to improve the pain and promote mobility always trying to restore the sagittal and coronal balance of the lumbar spine. Most investigators recommend a surgical decompression in the setting of major neurological deficit, progressive neurological loss, and substantial compromise of the spinal canal [3,6].

Debate arises over the appropriate type of approach for the treatment of thoracolumbar burst fractures with neurological compromise [2]. Scientific evidence is lacking for the superiority of one surgical technique over the other. Posterior surgery decreases surgical trauma and time and can be effective and safe surgical method for selected cases. An early posterior stabilization with additional bone grafting allows for a stable fixation of the spine with restoration of the dorsal tension band function, allowing for the possibility of early mobilization.

The highlight of this technique is that, through a posterior approach, removal of the retro paused fragments eliminated the need to anterior surgery and hence minimized the morbidity associated two-stage surgery if the patient had initial anterior surgery. The same result would have been achieved by anterior surgery but with increased risk of blood loss through corpectomy, morbidity and duration of surgery and additional posterior surgery later. This technique is recommended in the lumbar region, below the level of L1 where the conus medullaris ends and damage to the spinal cord is avoided.

Conclusion

An L4 burst fracture leading to neurological compromise in a 28-year-old gentleman has been successfully treated with a posterior alone approach with satisfactory outcomes after an 8-year follow-up.

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