Minimally invasive surgical management of a fracture-dislocation at the thoracolumbar junction

Manejo cirúrgico minimamente invasivo para fratura com deslocamento da junção tóraco-lombar

Raphael Vicente Alves, MD1
Wilson T. Asfora, MD FRCSC FACS2

ABSTRACT

Introduction: The surgical approach to treat thoracolumbar fractures is controversial. Case Report: The authors report the case of an L1 fracture-dislocation treated through posterior approach to perform spinal canal decompression, interbody fusion, transpedicular stabilization, posterolateral fusion, and reduction of kyphotic deformity. Conclusion: Minimally invasive surgical procedure with circumferential arthrodesis through the posterior approach could be considered an option to manage selected L1 fracture-dislocation.

Keywords: Minimally invasive; Lumbar spine fractures; Posterior lumbar interbody fusion.

RESUMO

Introdução: O acesso cirúrgico para o tratamento de fraturas tóraco-lombares é controverso. Relato de Caso: Os autores relatam o caso de uma fratura com deslocamento de L1 tratada através do acesso posterior no qual se realizou descompressão do canal espinhal, fusão interssomática, estabilização transpedicular, fusão póstero-lateral e redução da deformidade cifótica. Conclusão: O procedimento cirúrgico minimamente invasivo com artrodese circumferencial através do acesso posterior poderia ser considerado uma opção de tratamento em casos selecionados de fratura com deslocamento em L1.

Palavras-chaves: Minimamente invasivo; Fraturas lombares; Fusão lombar interssomática posterior

INTRODUCTION

Fast technological development and sophistication over the last years has made spine surgery safer, less invasive, and more effective. Minimally invasive spine surgery has the same surgical goals of conventional open techniques however, this technique is performed through a smaller access corridor. This corridor must provide enough space to perform an effective spine procedure and to keep the surrounding neural tissue intact.

The authors report a case of an L1 fracture treated through posterior approach to perform spinal canal decompression, interbody fusion, transpedicular stabilization, posterolateral fusion, and reduction of kyphotic deformity.

CASE REPORT

HISTORY AND EXAMINATION

A 37-year-old man was brought to the emergency room after a snowmobile accident. The patient stated that immediately after the accident he was unable to move his legs. However, he experienced a partial recovery of his right lower limb after prehospital immobilization. At the time of admission in the emergency room he was ASIA Grade C. Bladder function, sphincter tone...
and perineal sensibility were intact. Radiography revealed a fracture-dislocation at the thoracolumbar junction with severe spinal canal effacement. (Fig. 1A) Patient underwent computed tomography (CT) scan which revealed a compression fracture at L1 with comminuted fragments extending into the spinal canal; Retropulsion and tilting of the vertebral body at approximately 11 mm into the spinal canal. (Fig. 1B and 1C) Magnetic resonance imaging (MRI) revealed the conus medullaris above to the fracture and no evidence of cord contusion or abnormal intramedullary signal. (Fig. 1D). A fracture-dislocation at L1 was diagnosed (subtype B.1.2 according to Magerl classification) and the patient underwent operation through posterior approach to restore vertebral column stability and to perform spinal canal decompression.

**SURGICAL PROCEDURE**

The procedure was performed under general anesthesia with the patient carefully prone positioned on gel rolls. Surgical table was adjusted to gain distraction and reduction of kyphotic deformity. After antiseptic techniques, a skin incision measuring 5 cm long was marked under fluoroscopic control. A standard midline posterior subperiosteal dissection was carried out from T12 to L2. A subtotal bilateral laminectomy at L1 was performed with a high-speed drill under microscope magnification. Spinous process and midline ligaments were preserved. Medial facetectomy was performed to expose nerve root and lateral aspect of dural sac. When direct visualization of nerve roots and dural sac was obtained, we proceeded medial facetectomy until total resection of facets. The ligamentum flavum was removed to search for tears on the thecal sac. Medial and superior resection of L1 pedicles at both sides allowed an access corridor to the posterior upper halves of the affected
vertebral body. This exposure created space enough to remove the retropulsed fragments and access the superior part of L1 vertebra with an adjacent intervertebral disc. An epidural hematoma was removed. Complete discectomy of L1 - T12 level was performed in order to clear the interspace and better decompression of the spinal canal. Bone fragments were pushed back into its anatomic position. After dural sac gentle retraction, titanium cages were packed at both sides with autologous bone (laminctomy) associated to bone morphogenetic protein. Fracture percutaneous transpedicular fixation was performed with Sextant instrumentation system (Sextant; Medtronic, Inc., Minneapolis, MN, USA) at T12 and L2. Posterolateral fusion was performed at the end of the procedure with local bone graft from laminctomy and facetectomy. The surgical wound was closed in layers and skin incision was closed with absorbable intradermal running sutures to improve cosmetic appearance and avoid discomfort associated to sutures removal. Application of sterile adhesive strips was done for 48h.

**POSTOPERATIVE FOLLOW-UP**

Rehabilitation was initiated immediately and patient began to take steps with the aid of a Jewett brace 1 day after surgery. At this time he was ASIA Grade D (4/5 weakness of proximal left lower limb). Postoperative x-rays revealed satisfactory vertebral alignment. (Fig. 2A and 2B) Postoperative CT scan showed adequate decompression of spinal canal, satisfactory vertebral alignment, and instrumentation in good position. (Fig. 2C and 2D). No complains of pain were reported 1 week after surgery.

**DISCUSSION**

NSpine surgery is frequently used in the treatment of traumatic thoracolumbar fractures which cause instability, affecting the spinal cord or nerve roots. The main treatment targets for unstable thoracolumbar fractures include effective spinal canal decompression and neurological recovery maximization, normal alignment restoration and deformity correction, spinal stability and osseous fusion of the affected segments. Also to minimize acute and chronic pain, allowing early mobilization and rehabilitation, and preventing secondary disability complications.

The surgery may be performed through anterolateral, posterior or combined approaches. The surgical approach depends on the fracture type, biomechanical and anatomical aspects of affected segments, and surgeon’s experience or preference.

Verlaan, et al. conducted an extensive review of the literature about the treatment of thoracolumbar burst fractures and concluded that evidence based guidelines are not available7. The specific approach to be used in the treatment of these fractures (anterior, posterior or combined approach) is controversial.

In the last years, some authors have reported case series and case reports about minimally invasive surgical management of lumbar burst fractures with circumferential arthrodesis through posterior approach1,3,4,6. There are some differences between the surgical techniques of these authors, but the main target is to perform spinal canal decompression, interbody fusion, transpedicular stabilization, posterolateral fusion, and reduction of kyphotic deformity, through the posterior approach. The publication of Maciejczak, et al. is very instructive on his minimally invasive spine technique.

The aim of this publication is to report the reproducibility of this minimally invasive spine surgery which allows circumferential reconstruction without the need of combined approaches. This technique permits an anterior and posterior stabilization with one incision at one surgical stage. Differently from other authors, we report an anterior stabilization with a titanium cage designed for posterior lumbar interbody fusion. This difference allowed a subtotal excision of the pedicles and no corpectomy. Due to decreased bone removal, this technique can be performed as an urgency surgery since it reduces procedure time. The posterior approach to the thoracolumbar spine is well-known to most neurosurgeons and the early intervention in these fractures is advantageous.

Although a favorable result in this minimally invasive technique was obtained, a long-term follow up will support or refute the effectiveness of the procedure in this case.

**CONCLUSION**

Patients with selected L1-fracture may be treated through the posterior approach to perform spinal canal decompression, interbody fusion, transpedicular stabilization, posterolateral fusion, and reduction of kyphotic deformity. This technique permits an anterior and posterior stabilization with one incision at one surgical stage and it could be considered a surgical option to manage selected L1 fractures.
REFERENCES


CORRESPONDING AUTHOR

Raphael Vicente Alves
Rua Estado de Israel 907, apto 31
São Paulo, SP - Brasil
CEP 04022-002
raphaelvalves@yahoo.com.br