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Case Report

Minimally invasive lateral transpsoas approach for lumbar corpectomy and stabilization

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ABSTRACT

Background: Here, we present our experience with the minimally invasive (MI) transpsoas approach for lumbar corpectomy and stabilization. Transpsoas approach accesses the lumbar spine and includes both the direct lateral interbody fusion and extreme lateral interbody fusion techniques. Both procedures utilize a tubular retractor system which facilitates adequate retraction and direct visualization of the target, while supposedly reducing soft tissue trauma.

Case Description: We evaluated two patients, one with a traumatic L2 wedge compression fracture and the other with an L3 pathological compression fracture due to multiple myeloma. Both patients underwent MI transpsoas lumbar corpectomy, anterior column reconstruction with an expandable cage, and posterior pedicle screw instrumentation to correct a kyphotic deformity. Both patients were mobilized on the 1st postoperative day and experienced significant postoperative pain relief.

Conclusion: In two cases involving L2 and L3 compression fractures, MI transpsoas lumbar corpectomy was safely performed, with reduced perioperative and postoperative morbidity. Here, the transpsoas approach also allowed for early mobilization, adequate postoperative biomechanical stability, and resulted in immediate good outcomes.

Keywords: Lateral approach, Lumbar corpectomy, Minimally invasive surgery, Transpsoas approach

INTRODUCTION

Conventional posterior open approaches for lumbar corpectomy have many drawbacks; complete facetectomy, extensive paraspinal muscle dissection, prolonged retraction resulting in ischemia, and muscle injury. These contribute to significant postoperative pain, infection risk, and disability.[1-5,8]

Minimally invasive (MI) techniques have lower approach-related complication rates in some studies, while others demonstrate greater risks attributed to inadequate visualization, which can be reduced by moving the expandable tubular retractor in cranial or caudal and medial or lateral direction allowing for adequate visualization. Understanding detailed anatomy and keeping precise surgical orientation are essential for this technique.

Potential benefits of MI include reduced soft tissue trauma, intraoperative blood loss, postoperative pain, along with faster mobilization, shorter hospital length of stay, and health-care costs.[1-5,8]

Here, we describe the MI lateral transpsoas approach to the lumbar spine to perform corpectomy and fusion. Two patients with L2 and L3 vertebral fractures underwent this surgery to the lumbar spine, accompanied by anterior column reconstruction with an expandable cage, and posterior pedicle screw instrumentation to correct kyphotic deformities.

Surgical technique

Utilizing somatosensory evoked and motor evoked potential monitoring, the patient is positioned in the right lateral decubitus position. The desired vertebral body level is localized under fluoroscopy; this is marked on the left flank. A 5–6 cm incision then allows for routine exposure of the retroperitoneal space.

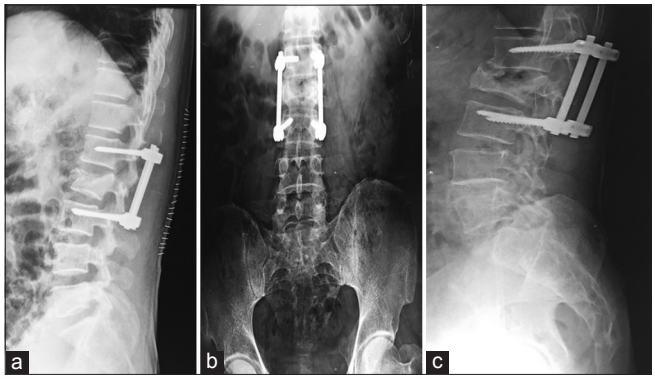

Figure 1: Case 1 – (a) Immediate postoperative fluoroscopic image of lumbosacral spine showing L2 wedge compression with pedicle screw at L1–L3 after primary surgery. (b and c) Anteroposterior/lateral fluoroscopic image of lumbosacral spine at 1 year post instrumentation showing progressive L2 vertebral body collapse with pedicle screw loosening at L1 and L3.

The first dilator is passed over a Kirschner wire and docked at the desired level. Retractors blades then expose the desired vertebrae. Discectomies caudal and cranial to the involved vertebra are then performed, and the corpectomy is completed in a piecemeal fashion. The end plates are decorticated and the interbody cage is inserted under fluoroscopy, followed by routine closure. The patient is then repositioned prone for the placement of posterior percutaneous pedicle screws.

Case 1

A 55-year-old male with an L2 wedge compression fracture first underwent an L1–L3 pedicle screw fusion elsewhere. For persistent increasing back pain, progressive pseudoarthrosis, vertebral body collapse, and focal kyphotic angulation, he required an MI lateral corpectomy [Figure 1: Case 1].

This included partial resection of the 12th rib, placement of an interbody expandable cage, and revision of the posterior fusion using T12 to L4 percutaneous pedicle screw fixation [Figure 2: Case 1]. He remained asymptomatic 6 months later.

Case 2

A 63-year-old female with multiple myeloma on chemotherapy presented with a pathological L3 vertebral body compression fracture presenting with worsening low

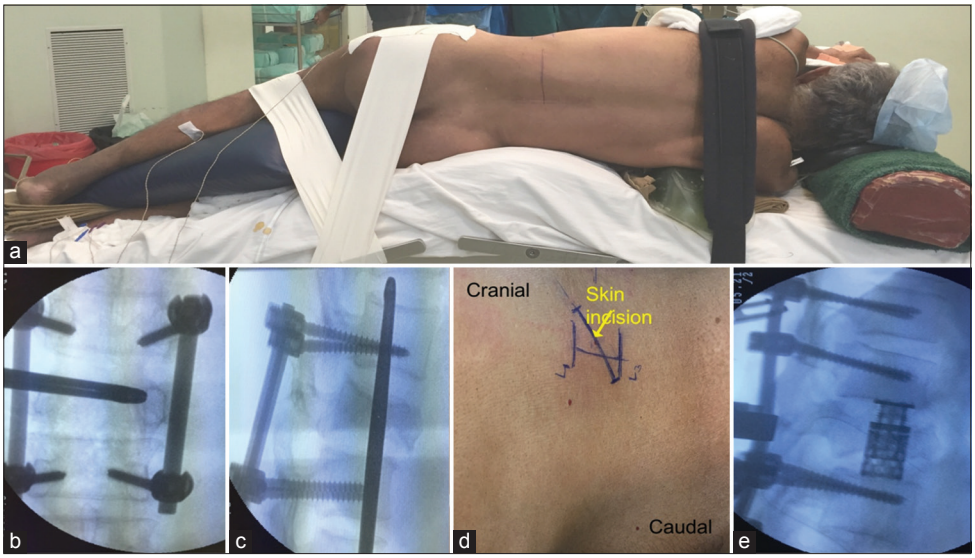

Figure 2: Case 1 – (a) Patient positioned in the right lateral decubitus position with the kidney bridge raised and table bent to provide access to the lumbar spine. (b and c) Localizing the target vertebrae on fluoroscopy and marking the safe zone to access the vertebrae. (d) Planned incision. (e) Lateral lumbar fluoroscopic image showing placement of the corpectomy cage and posterior pedicle screw fixation from D12 to L4.

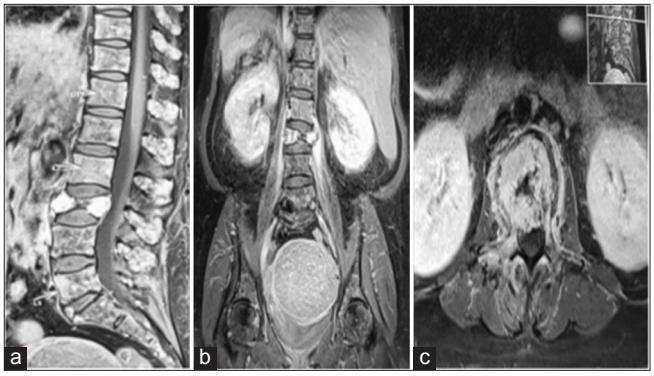

Figure 3: (a-c) Case 2 – Preoperative sagittal, coronal, and axial magnetic resonance imaging of the lumbar spine revealed severe compression collapse fracture of the L3 vertebral body with T2 marrow hyperintensities and mild retropulsion of the fracture fragments with thecal sac compression.

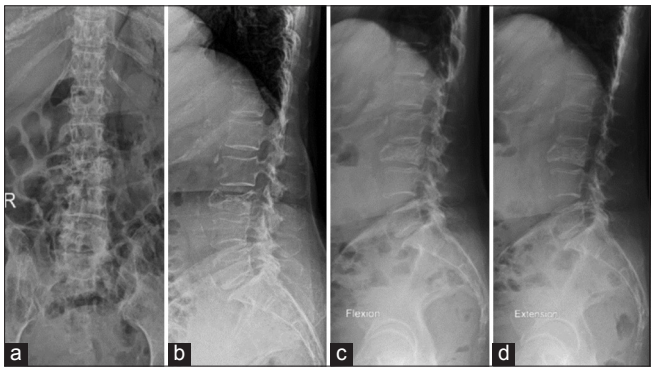

Figure 4: (a-c) Case 2 – Lateral and anteroposterior lumbosacral fluoroscopic image showing compression fracture L3 with diffuse osteopenia.

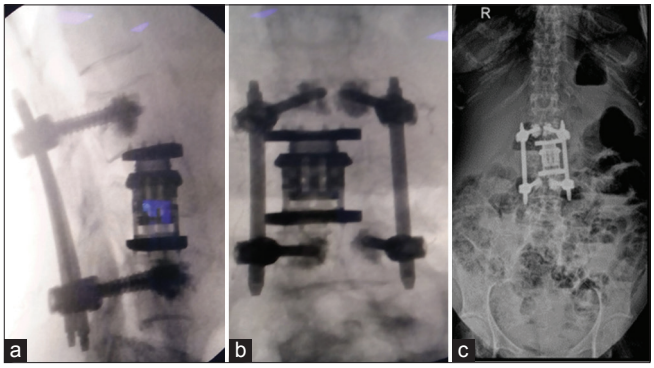

Figure 5: Case 2 – (a and b) Lateral and anteroposterior fluoroscopic image showing expandable cage with pedicle screw at L2 and L4. (c) Postoperative radiograph of lumbosacral spine at 4 months (anteroposterior) showing placement of the corpectomy cage and posterior pedicle screw fixation from L2 to L4.

back pain limiting her daily routine activities. The lumbar magnetic resonance imaging revealed 50% reduction in the L3 vertebral body height with dual-energy X-ray absorptiometry revealing osteopenia [Figure 3: Case 2 and Figure 4: Case 2].

She underwent an L3 MI lateral corpectomy using an interbody expandable cage, supplemented with polymethyl methacrylate followed by percutaneous posterior pedicle screw fixation from L2 to L4 [Figure 5a and b: Case 2]. She too was ambulated on post operative day 1. Follow-up X-rays confirmed adequate implant position and fusion across L2–L4 [Figure 5c: Case 2].

DISCUSSION

The recent innovations in spine surgery have prompted the utilization of MI techniques to decrease operative morbidity.

Ozgur *et al.* first described MI lateral approach for interbody fusion in 2016.[6] The same principles may be extrapolated for performing lumbar corpectomy as well. The lateral lumbar approach preserves the anterior longitudinal ligament, posterior longitudinal ligament, and facet joints while allowing for interbody fusion.[6,7] The lateral approach retroperitoneal dissection may occasionally prove difficult with prior surgery due to adhesions, bilateral retroperitoneal scarring (prior kidney surgery), risk of lumbar plexus injury, and anomalous vascular anatomy.[2,7] Intraoperative use of neuromonitoring also helps identify critical neural structures.[4]

CONCLUSION

MI lateral lumbar corpectomy is a promising technique for carefully selected patients but still carries significant risks.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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