

Clinical Study

Complications of the mini-open anterolateral approach to the thoracolumbar spine

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ABSTRACT

The mini-open anterolateral approach to the thoracolumbar spine is gaining popularity as a minimally-invasive alternative to traditional open thoracolumbar approaches. Published studies reporting and discussing the complications associated with this minimally invasive approach, however, are limited. We performed a retrospective review of patients undergoing the mini-open lateral approach to the thoracolumbar spine for corpectomy/fusion. Intraoperative and postoperative complications are reported and analyzed. Eighty consecutive patients underwent the mini-open lateral approach with corpectomy and fusion for trauma (71%), tumor (26%) and infection (3%). Total complication rate was 12.5% (dural tear 2.5%, intercostal neuralgia 2.5%, deep vein thrombosis 2.5%, pleural effusion 1.3%, wound infection 1.3%, hardware failure 1.3%, hemothorax 1.3%). Two patients needed a re-operation to address the complication (hardware failure, hemothorax). There were no postoperative neurological complications. The mini-open anterolateral approach to the thoracolumbar spine is an appealing alternative to the traditional open approaches. This technique, however, is technically demanding and requires proficiency in the use of minimally invasive spinal surgery instruments and retractors.

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1. Introduction

The anterolateral approach to the thoracolumbar spine is well described for the treatment of various pathologies including infection, tumors, and fractures.^{1–3} The “mini-open” approach is gaining popularity as a minimally invasive alternative to the traditional open anterolateral approach.^{4,5} This procedure, however, is technically demanding and the nuances are yet to be fully elucidated. The goal of this work is to report our perioperative complications with the mini-open lateral approach to the thoracolumbar spine.

2. Methods

A retrospective review was performed of a prospectively maintained database of thoracolumbar corpectomies performed at two institutions (University of South Florida and University Medical Center) between 2007 and 2011. All procedures, except three, were performed by the senior authors (J.S.U. and W.D.S.). Demographic variables such as sex, age, comorbidities, pathology, and presenting symptoms were documented. All perioperative complications were recorded. All patients were scheduled for routine follow-up at two weeks, six weeks, three months, six months, 12 months, and 24 months after surgery.

2.1. Surgical procedure

The technique for the mini-open lateral approach has been described.⁶ In summary, after proper lateral positioning and confirming orthogonal fluoroscopic images at the index level, a 5 cm to 7 cm oblique incision is made at the mid-axillary line. If necessary, part of the overlying rib is dissected carefully from the intercostal muscles and resected to be used later for graft material. The retropleural (or retroperitoneal) space is carefully entered and retracted anteriorly. In some instances, the approach becomes transpleural if large pleural tears develop. Typically tube thoracostomy is not needed if the visceral pleura is not violated. Serial dilators are used and an expandable retractor (MaXcess, NuVasive, San Diego, CA, USA) is secured with a flexible table-mounted assembly. At T12 and above, the rib head is resected and the corpectomy ensues in the typical fashion (adjacent level discectomies followed by corpectomy). An expandable titanium cage is then placed with anterolateral plating. Supplemental posterior fixation is utilized in select patients depending on pathology, degree of kyphosis/instability, and bone quality.

3. Results

Eighty consecutive patients undergoing the mini-open lateral approach were identified between 2007 and 2011. The mean age was 47 years and the male and female percentage was 64% and

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Table 1

Demographic characteristics of patients who underwent a mini-open anterolateral approach to the thoracolumbar spine

Characteristics	No. patients <i>n</i> = 80 (%)
Mean age (years)	47
Sex	
Male	51 (63.7)
Female	29 (36.3)
Diagnosis	
Trauma	57 (71.3)
Tumor	21 (26.3)
Infection	2 (2.5%)

Table 2

Complications of patients who underwent a mini-open anterolateral approach to the thoracolumbar spine

Complication type	No. patients <i>n</i> = 80 (%)
None	70 (87.5)
Complications	
Dural tear	2 (2.5)
Intercostal neuralgia	2 (2.5)
Deep vein thrombosis	2 (2.5)
Pleural effusion	1 (1.3)
Hardware failure	1 (1.3)
Wound infection	1 (1.3)
Hemothorax	1 (1.3)
Total complications	10 (12.5)

36% respectively (Table 1). The most common indication was trauma (71%) and the T12–L1 level accounted for 60% of the treated levels. The overall complication rate was 12.5% (Table 2). Two dural tears were encountered, and these were remedied with dural sealants without sequelae. Two patients underwent further surgery to address the complication. The first patient, a 51-year-old female, suffered an L1 burst fracture with canal compromise. She had back pain but no neurological deficits. The decision was made to treat operatively. She underwent a left-sided mini-open lateral L1 corpectomy with cage placement and lateral plating (Fig. 1A). In the immediate postoperative period, she continued to complain of back pain, particularly when sitting. Radiographs demonstrated collapse of the cage (Fig. 1B). She was reoperated for percutaneous posterior fixation to stabilize the construct (Fig. 1C). It was likely that the locking mechanism of the cage was not appropriately engaged during the first operation. Her symptoms resolved after the

second procedure. The second patient, a 59-year-old male, presented with T9–T10 osteomyelitis that was refractory to medical management and causing progressive kyphosis (Fig. 2A). He underwent a successful left lateral mini-open T9–T10 corpectomy with placement of an expandable cage and plating. Postoperative CT scans were satisfactory (Fig. 2B). Postoperatively, the patient continued to complain of chest pain and dyspnea. CT scan of the chest demonstrated a large left chest cavity fluid collection consistent with a hemothorax (Fig. 2C). He underwent video-assisted thoracoscopic surgery to washout the collection. No active bleeding was found. The patient recuperated well.

4. Discussion

The mini-open anterolateral approach to the thoracolumbar spine is emerging as a safe and effective alternative to the traditional open approach.^{4,5} The potential advantages of this minimally invasive surgical (MIS) approach include independence from an access surgeon, small incision, little blood loss, and short convalescence. This technique, however, is technically demanding. An understanding of regional neurovascular and visceral anatomy is essential, and experience with small working corridors, tubular retractors, and minimally-invasive instrumentation are mandatory.

Our overall outcomes analyses have been published in retrospective studies.^{4,5} The goal of this work was to highlight the complications (mostly technical) associated with the mini-open approach. Our complication rate with this technique in this cohort of 80 patients is 12.5%. Given the benefits of this MIS approach, including short incision, low blood loss, and short hospital stay, this rate compares favorably to that of published open thoracolumbar approach series. In a recent single-institution series that compared transpedicular to anterior thoracolumbar corpectomies, Lu et al.⁷ found a 32% overall complication rate with the anterior approach, including an 11% revision rate (three implant failures, one splenic injury, one deep wound infection). In a randomized study that compared anterior to posterior decompression and stabilization for traumatic fractures, Wood et al.⁸ demonstrated a 14% (three of 22) complication rate with the anterior thoracolumbar approach.

The goal of this work was to present our early, perioperative complications associated with the mini-open anterolateral approach to the spine. The choice of MIS surgery compared to open surgery, or even anterior compared to posterior approaches, is beyond the scope of this study. We favor the mini-open approach as

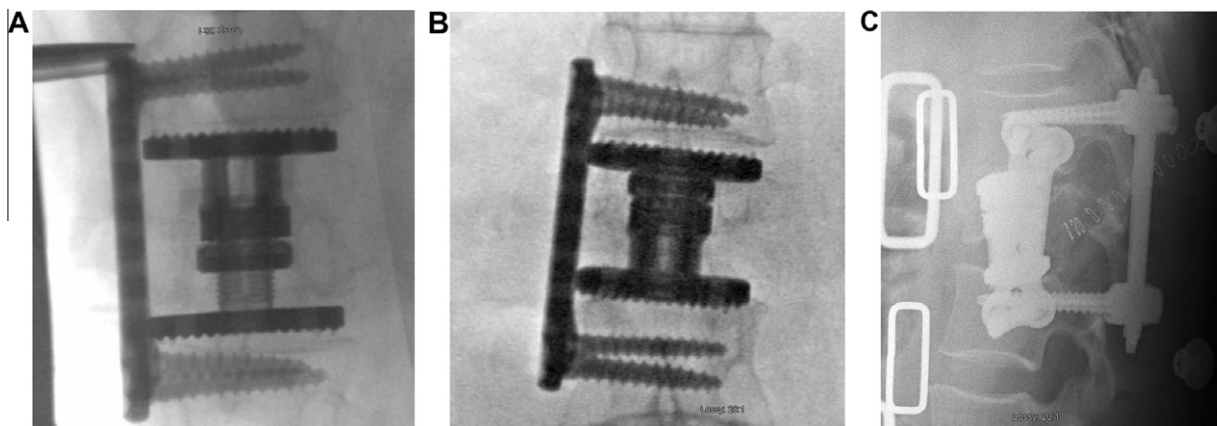


Fig. 1. Postoperative (A) anteroposterior fluoroscopic image after left-sided mini-open lateral L1 corpectomy with cage placement and lateral plating demonstrating good placement of the cage and plate; (B) anteroposterior fluoroscopic image demonstrating cage collapse as patient is about to undergo percutaneous posterior fixation; and (C) lateral radiograph demonstrating final construct.

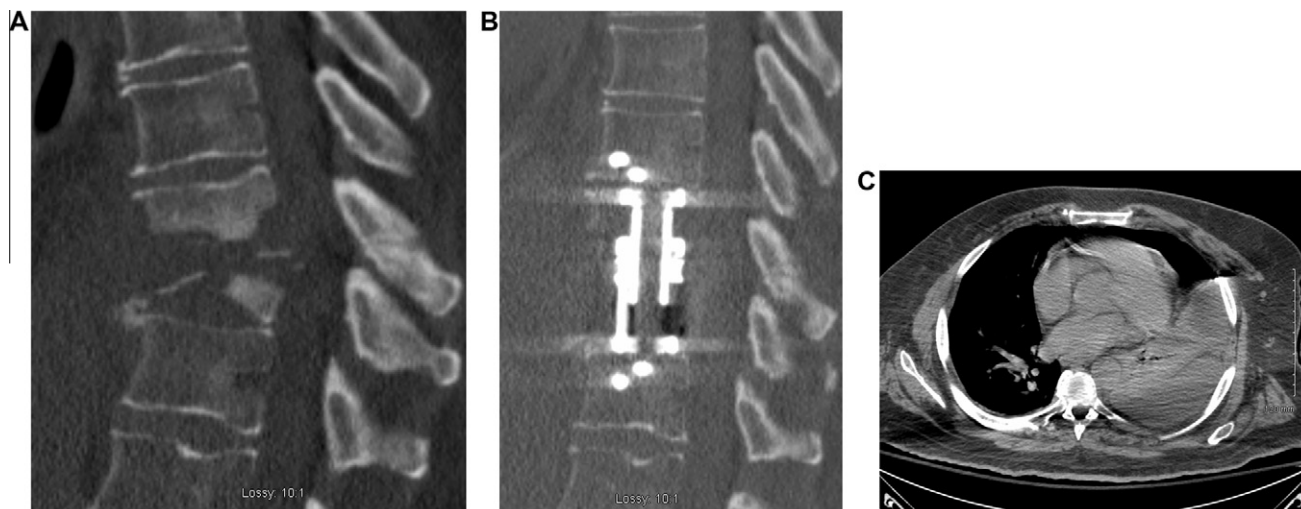


Fig. 2. (A) Preoperative sagittal CT scan demonstrating infection and kyphosis at T9–T10; (B) postoperative sagittal CT scan demonstrating good placement of the implant; and (C) axial chest CT scan demonstrating large left-sided hemothorax.

it obviates the need for an access surgeon, it allows for a shorter incision, and it does not preclude placing robust interbody cages and plating systems. However, the basic principles of anatomic understanding, three-dimensional surgical awareness, meticulous tissue dissection, careful endplate preparation and implant placement remain the same in open or MIS procedures.

5. Conclusions

The mini-open anterolateral approach to the thoracolumbar spine is an appealing alternative to the traditional open approaches. This technique, however, is technically demanding and requires proficiency in the use of MIS instrumentation. In this study, we have reported our complications with our early experience with the mini-open anterolateral approach to the thoracolumbar spine.

Disclosures and conflicts of interest

Doctors Juan Uribe and William Smith are paid consultants for NuVasive, Inc. No other disclosures or conflicts of interest have been reported.

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