Doria et al., Orthop Muscul Syst 2012, 1:3
DOI: 10.4172/2161-0533.1000108

Orthopedic & Muscular System: Current Research

Research Article Open Access

The Corpectomy Using Minimally Invasive Access in Thoracolumbar Fractures

C. Doria*, A. Zachos, F. Muresu and P. Tranquilli Leali

Unit of Orthopaedics and Traumatology, San Martino Hospital, Oristano, Italy

Abstract

Introduction: In our clinic for several years we are pursuing the concept of mini-invasive surgery applied to the spine. Increasingly we have to our attention patients with comorbidities (figure 1) and for this reason could not face a major surgery. In this work we analyze various patients who suffered an osteoporotic vertebral fracture. The fractures on CT and MRI study, presented a minimal back protrusion of the wall with no images related to compression of the structures (figure 2a, 2b, 2c), but presented deformities,like kyphosis. The deformities in the past would certainly have required anterior surgery and corpectomy with placement of a mesh and interbody stabilization. This method provides access to trans-abdominal peritoneal or retro peritoneal and often requires the collaboration of general and vascular surgeon due to the presence of abdominal viscera and major vessels.

Materials and methods: From January 2008 to August 2011, we treated 26 patients, 10 males and 16 females with a mean age 66 years. Most of them presented comorbidities. We decided to use a minimally invasive technique that allowed us to avoid the anterior approach, however, allowing us to attack the affected vertebrae through a less traumatic way possible. The surgery was performed by 2 surgical approaches performed in the same operative session. The first provided a lateral position with incision of about 4 cm. The exhibition allows direct visualization of the lateral side facilitating the disc discectomy, corpectomy, and the placement of a prosthetic vertebral body expansion and bone grafting. Through this technique it is possible to remove the fractured vertebral body and restore the mechanical support of the anterior column. The second half provided a hand lying prone and the insertion of pedicle screws cemented in the vertebral bodies adjacent to the fractured vertebra solidarity by means of two rods. The degree of kyphosis, construct height and the subsidence of the cage in relation to the vertebral endplates were measured preoperatively, early postoperatively, and at the latest follow-up.

Results: No intraoperative complications were observed. Faster functional recovery is observed and load was granted from the fifth to ninth day. Pain relief with reduction of VAS values (pre-op 9, post-op 5) and ODI (86% pre-op, post-op 38%).

Conclusions: The advent of minimally invasive surgery has allowed us to perform surgeries, such as the vertebral corpectomy, with minimal access, low blood loss, allowing rapid functional recovery with reduced length of stay.

Introduction

In our clinic for several years we are pursuing the concept of mini-invasive surgery applied to the spine. Increasingly we have to our attention patients with comorbidities (Table 1) and for this reason could not face a major surgery.

In this work we analyze various patients who suffered an osteoporotic vertebral fracture. The fractures, in all patients, on CT and MRI study, presented a minimal back protrusion of the wall with no images related to compression of the structures (Figure 1).

Thoracolumbar burst fracture, a common condition in clinic, often leads to severe spinal instability and neurologic deficit. The deformities in the past would certainly have required anterior surgery and corpectomy with placement of a mesh and interbody stabilization. This type of surgery is associated with higher morbidity, surgical time and blood loss. Vertebral corpectomy is common in the treatment of spinal canal compromise from fractures, tumors, infections, and degenerative deformities of the thoracic and lumbar spine [1-5]. Reconstruction of the vertebral body with a strut graft and anterior instrumentation allows restoration of the mechanical integrity of the anterior spinal column. a vertebral body replacement system should be stable, resist axial load-bearing, have a large interbody-bone interface to facilitate fusion and prevent migration, and restore height and sagittal alignment [7]. This method provides access to trans-abdominal peritoneal or retro peritoneal and often requires the collaboration of general and vascular surgeon due to the presence of abdominal viscera and major vessels.

Comorbidities	Number Patients
Chronic heart failure	5
Diabetes (type I and II)	7
Systemic Lupus Eritematosus	1
Rheumatoid Arthritis	2
Hypertension	20
Stroke	2
Mediterranean Anemia	1
Hypothyroidism	2
H. I. V	1
Chronic hepatitis	1
Crohn's disease	1
Chronic renal failure	2
Chronic obstructive pulmonary disease	1

Table 1: Comorbidities of the patients.

Materials and Methods

From January 2008 to August 2011, we treated 26 patients, 10 males

***Corresponding author:** C. Doria, Unit of Orthopaedics and Traumatology, San Martino Hospital, Oristano, Italy, E-mail: reemad@tiscali.it

Received Novmber 05, 2011; **Accepted** April 19, 2012; **Published** April 21, 2012

Citation: Doria C, Zachos A, Muresu F, Leali PT (2012) The Corpectomy Using Minimally Invasive Access in Thoracolumbar Fractures. Orthop Muscul Syst 1:108. doi:10.4172/2161-0533.1000108

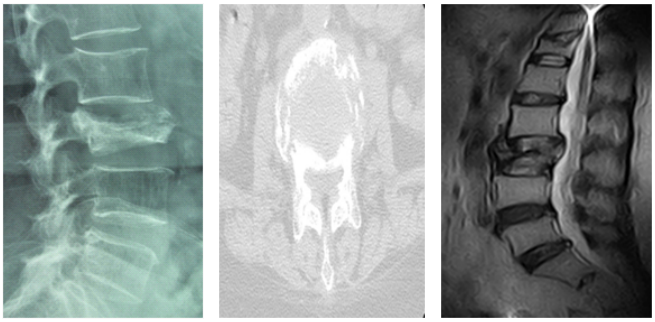


Figure 1: Female 73 y.o. Osteoporotic fracture of the vertebral body, vertebra plana (L3). We observe a minimal back protrusion of the wall, without serious compressions of the nervous structures.

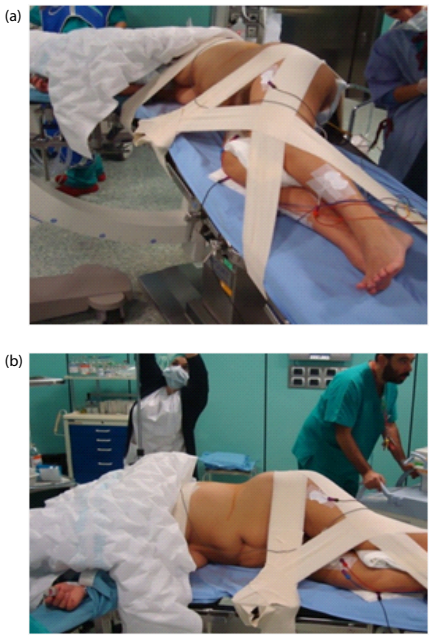


Figure 2: a) The patient is placed in the lateral decubitus position with the greater trochanter over the table break, and secured in place with tape. b) The table is flexed to increase the distance between the ribs and the iliac crest.

and 16 females with a mean age 66 years. All the fractures were type A, according to Magerl's classification [6]. Most of the patients presented comorbidities (Table 1). We decided to use a minimally invasive technique that allowed us to avoid the anterior approach, however, allowing us to attack the affected vertebrae through a less traumatic way possible. All the patients underwent at single level corpectomy and implantation of a mesh cage (Figure 4a, 4b). Single level reconstruction (T12=3, L1=7, L2=5, L3=5, L4=6) was performed in all patients. The surgery was performed by 2 surgical approaches performed in the same operative session.

Patient positioning

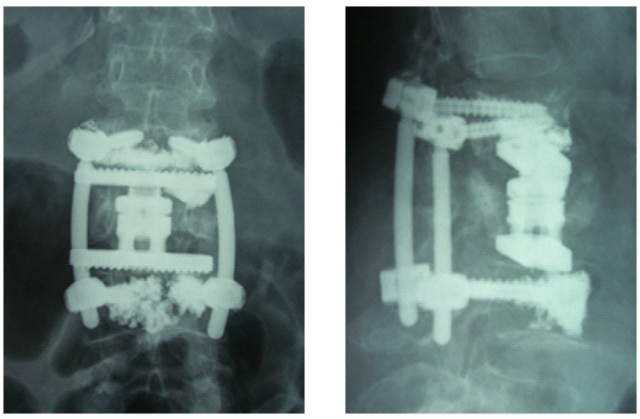
The patient is placed on a radiolucent operating table capable of flexing near its mid portion. After endotracheal intubation, general anesthesia is administered and lines are placed. The patient is placed in the true lateral decubitus position with the greater trochanter positioned directly over the table break. An axillary roll is placed, and all bony prominences are padded. The patient is secured to the operating room table using tape, and the table is flexed to increase the distance between the ribs and the iliac crest (Figure 2a and 2b). Fluoroscopy is used to ensure that good, unobstructed images of the disc space of interest have been obtained on both the crosstable anteroposterior (AP) and lateral views. The table is rotated as necessary to provide true AP and lateral images of the disc space. The skin is prepared and draping is performed in the usual manner.

First Surgical Approach

Retroperitoneal dissection

Experience has dictated that safe and reproducible passage through the retroperitoneal space is achieved with two incisions and gentle, blunt finger dissection [8,9], (Figure 3b). The first provided a lateral position with incision of about 4 cm (Figure 3a). The incision is located approximately four fingerbreadths posterior to the direct lateral incision. It is located just anterior to the intersection of the erector spinae and the abdominal oblique muscles. Exposure is achieved with an expandable three-bladed retractor, which allows for direct illuminated visualization (Figure 3c). The retractor system is attached firmly to the operating table with an articulating arm. An important feature of the retractor is the ability to stabilize the most dorsally oriented blade using an intradiscal shim, thus protecting the lumbar plexus from being compressed against the transverse process. The stabilization of the posterior blade allows the anterior blades to be safely deployed to create sufficient access space for discectomy (Figure 3d), corpectomy and implant placement. The exhibition allows direct visualization of the lateral side facilitating the disc discectomy (Figure 3d), corpectomy, and the placement of a prosthetic vertebral body expansion and bone grafting [10]. Discectomies (Figure 3d) are

Figure 3: a) Posterolateral incision. b) Retroperitoneal access. c) Light source. d) Annulotomy, corpectomy and preparation for the entry of the cage.



(a) (b)

Figure 4: a, b) Conventional x-rays in anteroposterior and lateral view. Show the corpectomy, insertion of the mesh and the cemented transpedicular screws.

performed both cephalad and caudal to the fracture using a scalpel to incise the anular tissue and a pituitary rongeur or curette to extract the disk material. The corpectomy is initiated by splitting the disrupted body with an osteotomy, and bone is removed with a high-speed burr, rongeur, or curette and saved for later implantation as cancellous autograft. the cartilaginous endplates of the vertebral bodies are eradicated with a burr or curette, providing a bleeding bony surface for vascular support of the graft. Through this technique it is possible to remove the fractured vertebral body and restore the mechanical support of the anterior column. The height can be adjusted to the corpectomy defect in situ, and correction of deformity and restoring height can be achieved.

Second Surgical Approach

The second half provided a hand lying prone and the insertion of pedicle screws cemented in the vertebral bodies adjacent to the fractured vertebra solidarity by means of two rods: Extreme care was taken while turning the patients in the prone position at the operating table. With the aid of image intensifier, anatomical landmarks are drawn on the skin. Transpedicular cannulated screws are then inserted in the pedicles of the vertebra above and below the fracture. With the appropriate instruments are inserted two rods, one for each side.

Results

No intraoperative complications were observed. Faster functional recovery is observed and load was granted from the fifth to ninth day. Conventional x-ray scans were available pre- and postoperatively in all patients. Angle was measured between the superior endplate of upper level vertebra to the corpectomy and the inferior endplate of lower level vertebra to the corpectomy [11]. The kyphosis angles were reduced to 3°—8° (mean, 5°). A mean vertebral height at time of the fracture of 21.8mm, which increased to 28.5mm post-operative and became 27.5 at final follow up. The segment height was evaluated by measuring the height of the involved vertebral segment, including the 2 adjacent intervertebral discs. In all patients, CT scans were performed 6 months postoperatively to document stability, fusion, subsidence, and possible hardware displacement. The evaluation of osseous fusion on the final radiographs was assessed, according to the grading system advocated by Bridwell [12]. Grade I indicates definite fusion (fused with remodeling and trabeculae present); Grade II indicates probable fusion (graft intact, not fully remodeled, no areas of lucency); Grade III indicates unlikely fusion (graft intact but lucency where it contacted the host bone surface); Grade IV indicates non-union (graft bone resorbed); and Grade V indicates that fusion could not be assessed. The fusion status on the final radiographs revealed Grade I fusion in 18, Grade II fusion in 7 and Grade V fusion in 1 patient. We calculated Pain relief with reduction of VAS values (pre-op 9, post-op 5) and ODI (86% pre-op, post-op 38%).

Conclusions

The advent of minimally invasive surgery has allowed us to perform surgeries, such as the vertebral corpectomy, with minimal access, low blood loss, allowing rapid functional recovery with reduced length of stay. Titanium mesh cages with cancellous autograft bone after corpectomy of the thoracolumbar spine provide immediate structural support to the anterior column. Determinate correction of the angular deformity, restore body height and stabilize the spinal column. Allow early mobilization and rehabilitation.

References

1. Alleyne CH Jr, Rodts GE Jr, Haid RW (1995) Corpectomy and stabilization with methylmethacrylate in patients with metastatic disease of the spine: A technical note. J Spinal Disord 8: 439-443.
2. Gokaslan ZL, York JE, Walsh GL, McCutcheon IE, Lang FF, et al. (1998) Transthoracic vertebrectomy for metastatic spinal tumors. J Neurosurg 89: 599–609.
3. Herman JM, Sonntag VK (1994) Cervical corpectomy and plate fixation for postlaminectomy kyphosis. J Neurosurg 80: 963–970.
4. McDonough PW, Davis R, Tribus C, Zdeblick TA (2004) The management of acute thoracolumbar burst fractures with anterior corpectomy and Z-plate fixation. Spine (Phila Pa 1976): 1901-1908.
5. Medow JE, Trost G, Sandin J (2006) Surgical management of cervical myelopathy: Indications and techniques for surgical corpectomy. Spine J 6: 233S- 241S.
6. European Spine Journal 3: 184-201
7. Benzel EC (2001) Biomechanics of Spine Stabilization. Thieme Medical Publishers, USA.
8. Heim SE, Pimenta L (2005) Surgical Anatomy and Approaches to the Anterior Lumbar and Lumbosacral Spine. In: DH Kim, AR Vaccaro, RG Fessler (eds), Spinal Instrumentation Surgical Techniques, Thieme Medical Publishers 706-711.
9. Wright N (2005) XLIF- the United States experience 2003–4, International Meeting on Advanced Spine Techniques, Banff, Canada.
10. Snell BE, Nasr FF, Wolfla CE (2006) Single-stage thoracolumbar vertebrectomy with circumferential reconstruction and arthrodesis: Surgical technique and results in 15 patients. Neurosurgery 58: ONS-263-268.
11. Hong JT, Lee SW, Son BC, Sung JH, Park CK, Kim MC (2006) Kyphotic angle measurement accuracy for vertebral osteoporotic compression fracture: reliable method for kyphotic angle measurement. J Korean Neurosurg Soc 39: 256-259.
12. Bridwell KH, Lenke LG, McEnery KW, Baldus C, Blanke K (1995) Anterior fresh frozen structural allografts in the thoracic and lumbar spine. Do they work if combined with posterior fusion and instrumentation in adult patients with kyphosis or anterior column defects? Spine 20: 1410-1418.