

VIDEO OF ORTHOPAEDIC TECHNIQUE

Anterior Reconstruction via a Relatively Noninvasive Retroperitoneal Approach for Lumbar Burst Fracture

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Introduction

Burst fractures are characterized by loss of height of the anterior vertebral body, fracture of the posterior wall or retropulsion of fracture fragments into the spinal canal¹. The aim of surgical intervention includes decompression of neural elements, restoration of vertebral body height, correction of angular deformity and stabilization of the spinal column². Various surgical procedures have been reported, including anterior, posterior and combined approaches. However, the optimal management of lumbar burst fractures remains controversial³. Some authors recommend posterior reconstruction because of various advantages, including safety, less technically demanding and wide surgical field of view^{2,4}, whereas posterior reconstruction is reportedly associated with surgical failure with increased kyphotic deformity or unimproved neurologic deficits^{3,5}. Some authors recommend anterior reconstruction in patients who have sustained neurologic deficits or kyphotic deformity⁵. However, concerns with the anterior approach include an increased risk of surgery-related soft tissue injury such as abdominal muscle dissection, greater blood loss and longer operative time and hospital stay^{6,7}. We have developed a less invasive anterior approach that keeps the abdominal muscles intact and used it to achieve anterior decompression and reconstruction in patients with lumbar burst fractures.

Case Presentation and Surgical Techniques

A 55-year-old man had a falling accident and presented with acute back pain and numbness and tingling in the left leg. Careful physical examination showed tenderness over the L₂ spinous process and decreased sensation over the medial aspect of the left thigh. Muscular strength and tendon reflexes of both lower limbs were normal, as were routine laboratory investigations. X-ray films revealed an L₂ burst fracture with vertebral body height collapse of more than 70%. CT scan

showed that fracture fragments had migrated and intruded into the spinal canal. MRI revealed that the posterior lumbar ligamentous complex was intact and the fracture fragments had intruded into the spinal canal and were compressing the L₂ nerve roots bilaterally. Therefore, the preoperative diagnosis was L₂ burst fracture. The load-sharing and Thoracolumbar Injury Classification and Severity scores⁸ were 8 and 5, respectively. Anterior reconstruction via a relatively noninvasive retroperitoneal lumbar approach with the procedures of anterior decompression, titanic mesh autograft implantation and internal fixation was planned.

After induction of general anesthesia, the patient was positioned in the right lateral decubitus position in left hip flexion; the operating table was flexed to open the lumbar region. The following landmarks for skin incision were identified: the anterior and posterior axillary lines, ribs 10–12 and the iliac crest. An oblique incision was made from the posterior axillary line under the 12th costal margin to the anterior superior iliac spine. After identified the posterior margin of the abdominal muscles, three layers of the semi-lucent fascia were released from the paravertebral musculature, keeping the abdominal muscles intact. The intact abdominal muscles were pulled ventrally, after which the retroperitoneal space was entered. The psoas muscle was elevated bluntly off the L₁ to L₃ lumbar vertebrae, after which the anterior-lateral side of the vertebrae was exposed. The disc materials, cancellous portion of the fractured vertebral body and the superior and inferior cartilage endplates of the adjacent vertebral bodies were then removed and the spinal canal decompressed by peeling the bone fragments away from the dura. Following decompression, an appropriate length of titanic mesh filled tightly with autogenous bone derived from the resected vertebral body was implanted in the decompressed space. Once the titanium mesh graft had been implanted, the adjacent segments were fixed

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with a lateral plate and four transvertebral screws. The operation time was 120 min with an estimated blood loss of 400 mL. Postoperative drainage volume was 80 mL. The patient took non-steroidal anti-inflammatory drugs for 3 days post-operatively and could stand beside the bed 3 days post-operatively. The duration of hospitalization was 10 days.

Discussion

Use of the anterior lumbar approach, allows direct visualization of the fractured vertebral body and its more complete removal. After removal of the fractured vertebra, the defect can be bridged with titanium mesh filled with autogenous bone to restore the anterior column. Compared with posterior surgery, this technique has been shown to yield better reconstruction of the comminuted or fragmented anterior column and better restoration and maintenance of the spinal

sagittal profile⁹. Moreover, the resected local bone from the fractured vertebra provides bone for grafting inside and around the titanic mesh with no donor site complications. In particular, the most important advantage of this novel approach is that it is relatively noninvasive. The three layers of abdominal muscles and paralumbar muscle are well preserved, which likely contributes to less blood loss and better post-operative rehabilitation. Additionally, because the abdominal muscles play an important role in tensile strength of abdominal wall, this approach potentially reduces the incidence of incisional hernia.

Video Image

Additional video images may be found in the online version of this article.

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