VIDEO OF ORTHOPAEDIC TECHNIQUE

Anterior Decompression and Reconstruction for Lumbar Burst Fractures

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Introduction

Burst fracture which tends to occur between T₉ and L₅ level is usually caused by a high-energy axial load such as motor vehicle accidents and falls, in which the margins of the vertebral body spread out in all directions making the spine much less stable than a compression fracture. The bone chips which spread out toward the spinal cord could bruise the spinal cord causing neurologic injury. There are more than 25,000 thoracolumbar burst fracture cases every year in the United States. Typical lumbar burst fracture can lead paralysis of the legs and loss of control of the bowel and bladder. In a mild burst fractures only partial paralysis or transient neurologic symptoms may be present. Surgical treatment is required when the burst fracture is unstable. The aim of the surgery is to reach adequate decompression and stabilization. The most popular technique is posterior approach, but there are many complications, including instrumentation failure, pseudarthrosis and so forth¹⁻⁴. Adequate anterior column support is necessary to prevent instrumentation failure^{5,6}. An anterior approach is effective for lumbar burst fractures with neural injury because it allows direct decompression and reconstruction^{7,8}. Anterior technique has been shown to have better reconstruction, better restoration, fewer complications and less operating time⁹⁻¹². What's more, anterior approach is strongly considered in the setting of unstable burst fracture at L₂-L₅ level because of the importance of biomechanical integrity and sagittal profile here^{11,13}. However, the extensive operative trauma and high technical requirements of anterior surgery limit its wide application. From the year 2000, we investigated a series of improvements in this procedure.

Case Presentation and Surgical Technique

A 32-year-old man fell from a height of 4 m 3 h prior to presenting with pain in his low back, difficult in urination and defecation and limitations in lower extremity activity. Careful physical examination showed tenderness and sensitiv-

ity to percussion at the L₃ spinous process. Decreased sensation was found over both lower extremities. The knee jerk and Achilles tendon reflexes were decreased and muscle strength in the two extremities (knee extension, ankle dorsiflexion and plantar flexion) was grade 3+. Routine laboratory investigations were normal. X-ray films revealed a burst fracture of L₃. CT and MR scans showed that more than 50% of the vertebral canal was occupied by bone chips at the L₃ level. Therefore, the preoperative diagnosis was L₃ burst fracture (AO type A3) with cauda equina syndrome and incomplete paralysis of the lower extremities. Anterior corpectomy and reconstruction with an expandable artificial vertebral body (Synthes, Solothurn, Switzerland) was planned.

After induction of general anesthesia, the patient was positioned in a right lateral decubitus position. A transverse incision was made at the L₃ level between the left anterior and posterior axillary lines and the external oblique, internal oblique and transverse abdominal muscles bluntly separated. Next, the prevertebral fascia was exposed through the retroperitoneal space. After the L₃ level had been confirmed fluoroscopically, a Synframe Retractor System (Synthes)¹⁴ was installed and four Hoffman retractors placed on the proximal and distal vertebrae to create a stable surgical field¹⁵. Before performing corpectomy, the L₃ segmental vertebral vessel was carefully ligatured and electrocoagulated. A routine corpectomy was then carried out and the spinal canal carefully decompressed. After both ends of the vertebral endplates had been scraped appropriately, an appropriately sized expandable artificial vertebral body with autogenous bone was inserted into the intervertebral space. The cage was then unfolded to achieve reduction. After the position of the cage had been confirmed fluoroscopically, the cage was fixed with a Ventrifix System (Synthes). The operation time was 90 min with an estimated blood loss of 300 mL. The incision length was 6.5 cm and the duration of hospitalization 7 days.

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Discussion

Compared with traditional anterior surgery¹⁶, only one rather than three levels of segmental vessels are severed in this improved procedure. Two Cobb elevators are used to press the segmental artery before cutting it, after which the two vessel ends are sufficiently dissociated before ligaturing (proximal part) or electrocoagulating (distal part) them. The integrity of the psoas is preserved thanks to the use of Hoffman retractors. The external oblique, internal oblique and transverse abdominal muscles are bluntly separated rather than being severed, thus the improved procedure is less invasive. The Synframe Retractor System¹⁴ offers a more stable operative field with a smaller skin incision and thus decreases the risks of vessel and organ injury during the pro-

cedure. This technique makes decompression of the spinal canal more direct and complete¹⁷. The expandable artificial vertebral body¹⁸ makes the reconstruction more effective and offers much stronger and more stable support¹⁹, which likely results in higher fusion rates and reduced rate of instrument failure compared with the traditional technique. In our experience, a satisfactory clinical outcome can be achieved by this technique.

Video Image

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

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