Transperitoneal Intervascular Approach for Repair of the Lumbar Spine

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Abstract

Keywords

- trauma
- artery
- repair
- dissection

This report describes a novel anterior surgical approach to the midlumbar spine. A transperitoneal dissection separating the tissue planes between the infrarenal vena cava and abdominal aorta allows for ample exposure in the reconstruction of midlumbar vertebral body fractures.

Surgical approaches to the lumbar spine include anterior, posterior, or combination approaches. Some authors advocate mini-open and endoscopic approaches as well. The transperitoneal and retroperitoneal approaches to the superior lumbar vertebrae are traditionally performed by retracting the abdominal aorta to the patient's right because the arterial structures are more resistant to surgical trauma and easier to manipulate than the large veins. Our case report shows that lumbar corpectomy and arthrodesis can be safely performed in a plane created between the abdominal aorta and inferior vena cava.

A 23-year-old man, with a history of schizophrenia, attempted suicide by jumping off a bridge ~20 feet off the ground. He sustained a L3 burst fracture and bilateral calcaneal fractures. On physical exam he had preserved sensation and normal reflexes, however weakness in the iliopsoas and quadriceps femoris muscles bilaterally. Computed tomographic scan showed an unstable L3 burst fracture with 70% canal compromise and no significant kyphosis. Surgical decompression and stabilization were recommended because of the presence of neurologic deficit.

An open L3 corpectomy and cage reconstruction was planned in two stages. In the first stage, the patient was placed in a supine position and the abdominal cavity was entered through a transperitoneal midline vertical incision. The omentum and transverse colon was retracted superiorly and the small intestine was retracted to the patient's right exposing the retroperitoneum. A longitudinal incision in the posterior peritoneum was

made from the ligament of Treitz down along the course of right common iliac artery. The duodenum was mobilized and the retroperitoneum over the aorta and inferior vena cava was incised. Both vessels were mobilized and dissected circumferentially by ligating the segmental lumbar arteries and veins. The inferior mesenteric artery was identified and preserved. The inferior vena cava was retracted to the patient's right and the aorta to the left (►Figs. 1 and 2). The anterior longitudinal ligament was opened, L3 corpectomy was performed, and 19-mm expandable cage was placed with autologous bone graft and allograft around the cage. Somatosensory-evoked monitoring was used throughout the case. The retroperitoneum and abdominal wall were closed using standard techniques. In the second stage, patient was placed in prone position, and percutaneous stabilization with pedicle screw fixation from L2 to L4 was performed. Postoperatively patient had preserved distal pulses, he recovered well with return of bowel function on postoperative day 3, and his neurologic deficits resolved completely.

Discussion

Lumbar burst fractures are a common injury resulting from falls from height, motor vehicle accidents, and other modes of trauma. Indications for surgical intervention include more than 50% loss of vertebral body height, more than 50% canal compromise, more than 30% of kyphosis, or the presence of neurologic deficit. The goal of surgery includes

Fig. 1 Intraoperative photograph. Arrow on vertebral body, forceps on aorta.

decompression of the neural elements to facilitate neurological recovery, correction of spinal deformity, fusion with rigid stabilization, and maintenance of anatomic alignment and early mobilization of the patient.

There are numerous surgical approaches to the lumbar spine including anterior transperitoneal, anterior retroperitoneal, anterolateral, trans-psoas, and posterior approaches

Fig. 2 Illustration of operative exposure.

as well as combined, mini-open, and endoscopic anterior approaches.¹ Advocates of the transabdominal approach cite surgeon familiarity and the ability to inspect the viscera for potential concomitant pathology as well as direct visualization, minimizing the risk of injury to the ureter and exiting nerve roots. Proponents of the retroperitoneal approach claim less intraoperative hypothermia, less insensible fluid losses, and fewer postoperative pulmonary complications and postoperative ileus.^{2,3}

The anterior approach to the thoracic and lumbar spine with corpectomy is a recognized treatment option for unstable burst fractures, vertebral body tumors, or vertebral osteomyelitis, combining the advantages of anterior decompression of the dural sac with biomechanical restoration of the compromised anterior load-bearing column. The development of rigid corpectomy reconstruction cages has made the anterior approach more attractive by improving the biomechanical strength of the anterior column support. The traditional anterior approaches to the lumbar spine are anterior retroperitoneal with patient in supine or lateral decubitus position and anterolateral with patient in lateral decubitus position. Both approaches are performed by dissecting the lateral border of the aorta and retracting it to the right, because generally the arterial structures are more resistant to surgical trauma and manipulation than venous structures. A potential source of iatrogenic injury in patients with unstable burst fractures is positioning in a decubitus position, which could lead to further migration of the unstable fracture fragments.⁴

We describe an alternative approach to the lumbar spine, which develops plane between the abdominal aorta and inferior vena cava that provides for an ample exposure for performing corpectomy. Spine exposures of the lumbosacral junction for discectomy generally require upward mobilization of the caval bifurcation, whereas lower lumbar exposures for discectomy are easily facilitated with lateral mobilization of the aorta. In this case, the patient had two complicating issues. First, he required a corpectomy which necessitates a more extensive exposure than a discectomy. Second, the location of the fracture was midlumbar spine. Given both these considerations, we believe that this technique is a suitable alternative that is safe and effectively provides significant exposure to the lumbar spine. To our knowledge, this is the first published report of this technique.

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