Lumbar Corpectomy by Using Anterior Midline Route

Dae Hyeon Maeng, M.D.,1 Seokmin Choi, M.D., Ph.D.,2 Sang-ho Lee, M.D., Ph.D.3

Departments of Thoracic Surgery,1 Neurosurgery,1 Gimpo Airport Wooridul Spine Hospital, Seoul, Korea
Department of Neurosurgery:2 Spine Center, Myongji St. Mary’s Hospital, Seoul, Korea

Direct anterior approach for lesions located anterior to the thecal sac is definitely superior to lateral or posterior approach in many respects. However, various anatomical obstacles and technical difficulties often hinder direct anterior approach. Thanks to ripe experience of retropertitoneal approach to the lumbar spine for anterior lumbar interbody fusion and total disc replacement, the authors could perform lumbar corpectomy and reconstruction by using midline retropertitoneal approach recently. During this approach, we repaired anterior longitudinal ligament also to reduce the risk of graft extrusion and to prevent erosion of vascular wall due to direct contact between metallic hardware, which was used for reconstruction of vertebral body, and major vessels.

KEY WORDS: Lumbar - Corpectomy - Midline - Anterior longitudinal ligament.

Introduction

It is well known fact that direct anterior approach for lesions located anterior to the spinal cord or thecal sac is safer and more effective than posterior or lateral approach10. However, direct anterior approach to the lumbar spine is hindered by great vessels. Conventional approach for lumbar corpectomy often necessitates wide skin incision and inevitably injures the important muscular structures10. Generalization of total disc replacement(TDR) and anterior lumbar interbody fusion (ALIF) has promoted the advances in minimally invasive retropertitoneal approach to the lumbar spine. Recently, experienced access surgeons can perform ALIF or TDR for single lumbar disc level by using less than 7cm midline skin incision10. Thanks to ripe experience of ALIF and TDR, the authors could perform lumbar corpectomy and reconstruction by using anterior midline route. The aim of this report is to present a new technique of this variant of mini-ALIF using midline skin incision and retropertitoneal route.

Materials and Methods

Patient population

Between January 2003 and April 2004, 18 patients underwent lumbar corpectomy at our hospital. In five of 18 patients, lumbar corpectomy by using minimally invasive midline approach was performed, and this was followed by posterior fixation. There were three men and two women. The mean age of the patients at operation was 54 years. The patients’ demography and important clinical features are summarized in Table 1.

Operative technique

Place the patient in the supine position on the table. The approach surgeon stands on the right and the assistant on the left for left side approach. After verifying the level of interest using C-arm fluoroscopy, a vertical midline skin incision was made. Carry the incision to the anterior rectus sheath in the midline. After blunt dissection beneath the rectus muscle belly using finger, the anterior rectus sheath including left rectus muscle belly is then retracted anteriorly and laterally with self-illuminating hand-held retractor (Fig. 1). At this point, surgeon should take great care not to injure inferior epigastric vessels. The peritoneal sac is bluntly dissected away from the posterior rectus sheath. A longitudinal incision is made in the posterior rectus sheath. Continue blunt dissection with peanut sponge along the retropertitoneal fat tissue. After the psoas muscle is reached, surgeon should try to elevate the peritoneum away from the psoas muscle. The ureter is always retracted to the right with the peritoneum. Soft tissue and
major vessels on the lumbal vertebral body are mobilized from left to right. It is very important to expose the sufficient length of the major vessels as far as possible to prevent vascular injuries owing to excessive retraction. The lumbar segmental vessels coursing transversely to the vertebral body must be ligated and cut to make sufficient room laterally. For L5 corpectomy, the ileolumbar vein must be ligated and cut to release the common iliac vein from tether. Once the major vessels have been mobilized, a table-held Robotrac retractor (Aesculap, Germany) (Fig. 1) would have been placed in cephalad position to widen the working space. After confirming the lesion of interest using C-arm fluoroscopy, H-shaped incisions were made on anterior longitudinal ligament (ALL) (Fig. 1). At this moment, special attention should be paid not to injure sympathetic trunks located at both lateral margin of working space. Flaps of ALL were peeled off from midline using angled blunt dissectors and forceps. Then, rectangular incisions are made on adjacent intervertebral discs. After disectomy, lateral gutters are made on vertebral body using chisel. Ventral half of vertebral body is removed using rongeur and pituitary forceps. Remaining portion of vertebral body is thinned till tiny cortical shell is remained using high-speed drill with diamond tip with aid of microscope. Remaining bony fragments are removed using angled curette and Kerrison punch. After complete decompression, instrumentation is performed. In our five cases, Harms titanium mesh cages (Depuy Acromed Raynham, USA) filled with mashed allograft were used for reconstruction of vertebral body (Fig. 2). Flaps of ALL were approximated with interrupted non-absorbable sutures (Fig. 1). After checking the integrity of the vessels thoroughly, the retractors are removed sequentially. The anterior rectus sheath is firmly approximated with interrupted absorbable sutures.

**Discussion**

In conventional retroperitoneal approach to the lumbar spine, important muscular structures are inevitably injured.\(^{1,2}\)
Corpectomy by Midline Route | DH Maeng, et al.

and decompression of contralateral side is troublesome. Although recently, Muhlbauer et al. reported a minimally invasive retroperitoneal approach for lumbar corpectomy, they did not use anterior midline approach and the skin incision for single level corpectomy was not short (5-inch)\(^7\).

Compared with midline anterior approach, lateral or anterolateral approach to the lumbar spine may have more chances to injure psoas muscle and genitofemoral nerve. In case of lateral approach for lumbar burst fracture, removal of posteriorly displaced bony fragment is very troublesome and sometimes dangerous. If surgeon approaches to severely compromised spinal canal from intact epidural space after removal of intervertebral discs of adjacent levels using anterior midline approach, even severely displaced bony fragments would be removed easily. In all our 5cases, complete decompression was possible, and it was verified by computed tomography scan postoperatively (Fig. 3). As we did not perform muscle dissection, postoperative pain originated from damaged muscle could be reduced. Thanks to ripe experience of ALIF and TDR for several years, we could perform single level lumbar corpectomy using midline retroperitoneal approach with less than 8cm skin incision. Anterior extrusion of graft or hardware can cause catastrophic event. There are several reports regarding tactics or devices for preventing extrusion of graft in anterior approach.\(^6\)

However, instruments which were used to prevent extrusion of the graft also have some risk of pull-out and are not always applicable to all kinds of grafts or cages.\(^6\) Markwalder et al. already pointed out the risk of vascular erosion due to the head of screw which was in direct contact with vascular structure.\(^6\) As the ALL is a very strong structure, repair of the ALL after placement of bone graft or hardware is expected to reduce the risk of graft extrusion. Besides, repair of ALL may reduce the risk of vascular erosion due to chronic irritation. This tactic may be especially helpful to the patients with severe osteoporosis or discitis who cannot withstand rigid instrumentation.

Although the number of patients was small and the follow-up periods were short, there have been no intraoperative or postoperative complications so far. The mean operative time of our cases was 3.98hours (range 3.5-4.33hours). It is shorter than that of Muhlbauer et al's cases in which they used anterolateral route\(^5\). From this point of view our technique for lumbar corpectomy can be judged as one of minimally invasive techniques. Compared with anterolateral or lateral approach, anterior midline approach could provide wider working space for corpectomy and offered more optimal view for anatomical reconstruction. However, it has a limitation of not being applicable to L1 or L2 corpectomy owing to anatomical obstacles including renal vessels.
Conclusion

Lumbar corpectomy by using midline retroperitoneal approach is technically feasible. It can provide safe way for decompression of anteriorly located compressive lesion in lumbar spine, excluding L1 or L2 level. Repair of ALL is expected to reduce the risk of graft or hardware extrusion.

Acknowledgement
This study was supported by a grant from Wooridul Spine Foundation.

References