

Lumbar Corpectomy by Using Anterior Midline Route

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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 retroperitoneal 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 retroperitoneal 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 approach^{1,7)}. 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 structures^{3,7)}. Generalization of total disc replacement(TDR) and anterior lumbar interbody fusion (ALIF) has promoted the advances in minimally invasive retroperitoneal 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 incision²⁾. 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 retroperitoneal route.

Materials and Methods

Patient population

Between January 2003 and April 2004, 18patients underwent lumbar corpectomy at our hospital. In five of 18patients,

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 54years. 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 left 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 retroperitoneal 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

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Table 1. Summary of demographic, pre-, and postoperative data in 5 patients

Case	Age	Sex	Diagnosis	Symptom	Operation	Complication
1	62	male	L3 burst fracture kyphotic deformity	LBP leg pain (both)	L3 corpectomy, L4-5 ALIF, L2,4,5 pedicle screw fixation and posterior fusion	None
2	60	female	Osteoporotic burst fracture (L3) degenerative kyphoscoliosis	Stooping LBP NIC	L3 corpectomy, ALIF L4-5, L5-S1, T12, L1, 2,4, 5, S1 pedicle screw fixation and posterior fusion	None
3	50	male	L4 burst fracture	LBP leg pain (both)	L4 corpectomy, L3,5 pedicle screw fixation and posterior fusion	None
4	49	male	L4 burst fracture	LBP buttock pain	L4 corpectomy, L2,3,5 pedicle screw fixation and posterior fusion	None
5	49	female	L3 compression fracture post-traumatic kyphosis	LBP Stooping	L3 corpectomy, ALIF L4-5, L1,2,4,5 pedicle screw fixation and posterior fusion	None

LBP : low back pain, NIC : neurogenic intermittent claudication, ALIF : anterior lumbar interbody fusion

major vessels on the lumbar 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 dissector and forcep. Then, rectangular incisions are made on adjacent intervertebral discs. After discectomy, lateral gutters are made on vertebral body using chisel. Ventral half of vertebral body is removed using rongeur and pituitary forcep. Remained portion of vertebral body is thinned till tiny cortical shell is remained using high-speed drill with diamond tip with the aid of microscope. Remained bony fragments are removed using angled curette and Kerrison punch. After complete decompression, instrumentation is performed. In

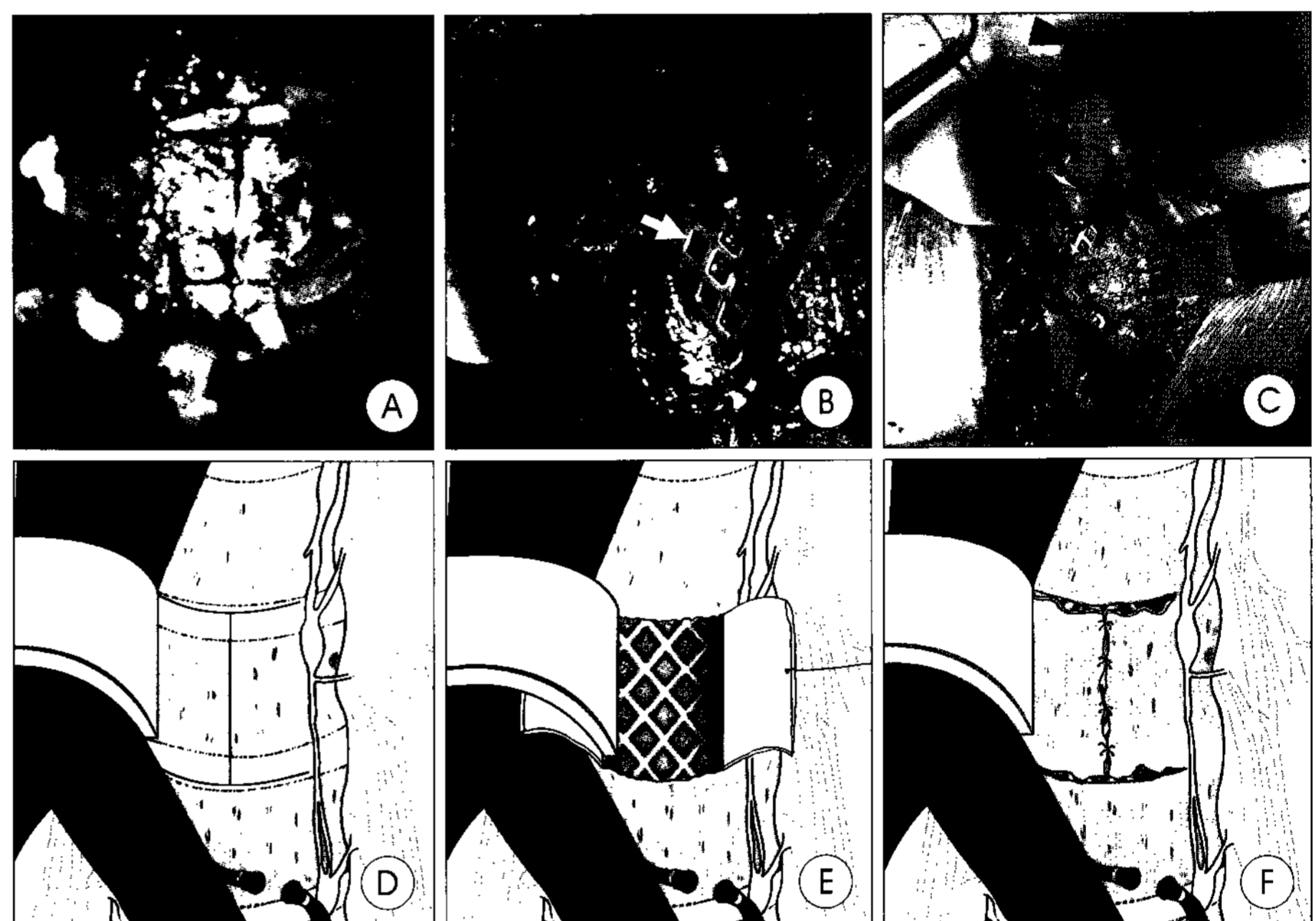


Fig. 1. Intraoperative photographs (A, B, and C) and the schematic illustrations (D, E, and F) of case 4. A and D : After mobilization of major vessels from left to right, H-shaped incisions are made on adjacent discs and midline. B and E : Titanium mesh cage (white arrow) placed in defect of corpectomy and flap of anterior longitudinal ligament (white asterisk). C and F : Photograph shows repaired anterior longitudinal ligament covering mesh cage. Black arrow head and black asterisk indicates a table-held robotrac retractor and a self-illuminating light retractor, respectively.

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^{3,7)}

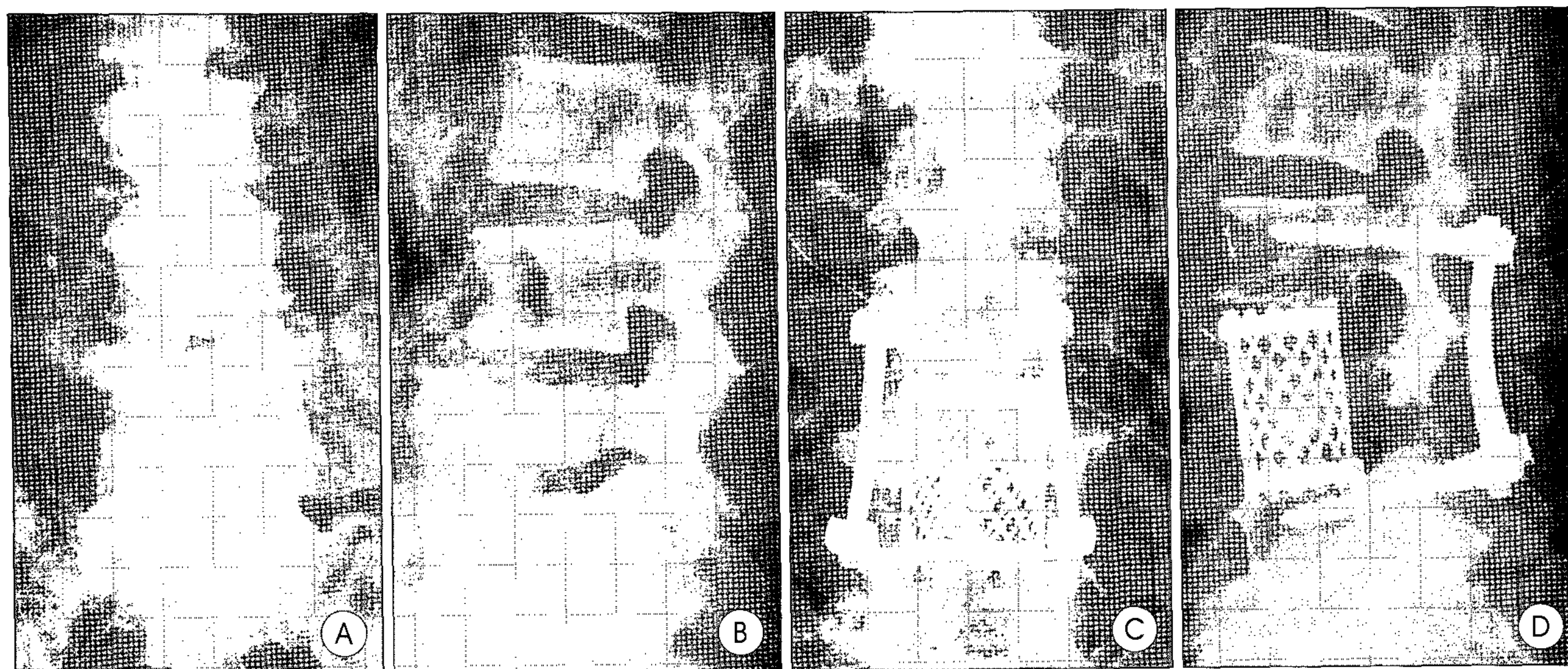


Fig. 2. Plain radiographs of case 3. Preoperative anteroposterior (A) and lateral (B) images show burst fracture of L4 vertebra. Postoperative anteroposterior (C) and lateral (D) images demonstrating restoration of normal alignment and well positioned instruments.

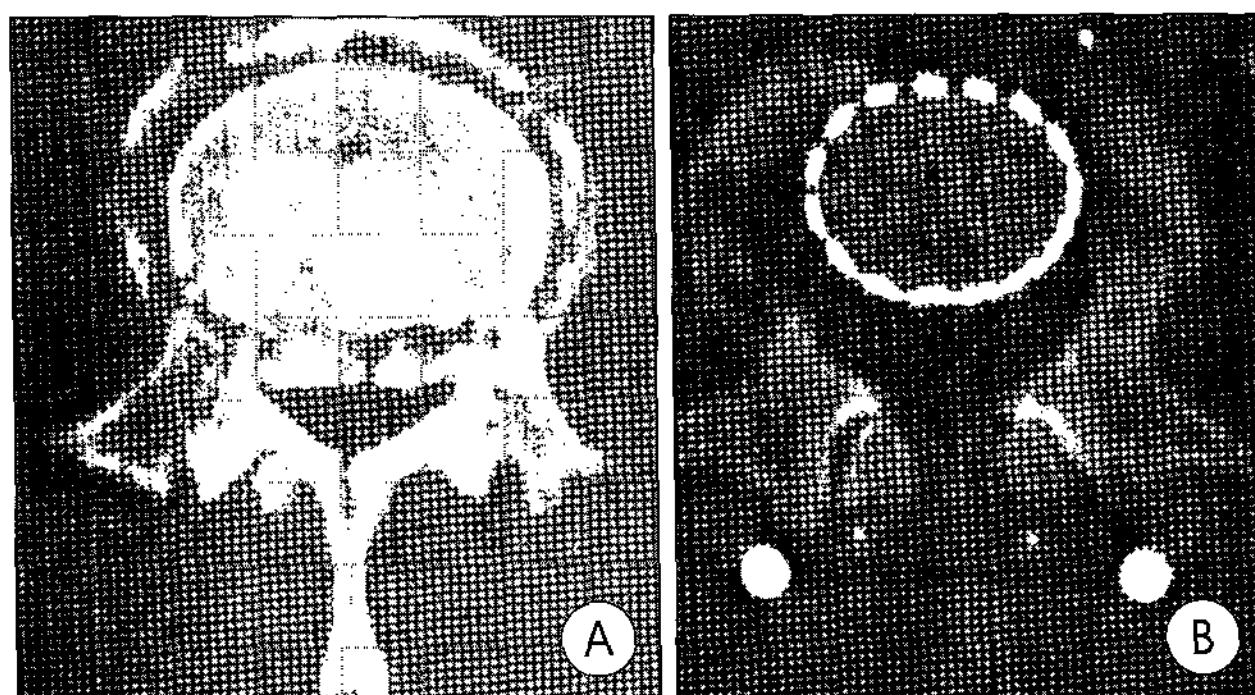


Fig. 3. Preoperative axial computed tomography scan of case 3 (A) shows retropulsed bony fragments encroaching spinal canal. Postoperative axial computed tomography scan (B) demonstrating fully decompressed spinal canal and well positioned cage.

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 5 cases, 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^{4,6}.

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^{4,6}. Markwalder et al. already pointed out the risk of vascular erosion due to the head of screw which was in direct contact with vascular structures⁶. As the ALL is a very strong structure^{5,8}, 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 3.98 hours (range 3.5~4.33 hours). It is shorter than that of Muhlbauer et al's cases in which they used anterolateral route⁷. 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.

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