

Abdominal Pseudohernia after Extreme Lateral Interbody Fusion Procedure: A Case Report

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The minimally invasive lateral transposas approach, which is known as extreme lateral interbody fusion (XLIF), has been developed as a spine fusion technique allowing access to the lumbar disc space and vertebral body without extensive muscle dissection. Although this technique is safe and reproducible, approach-related neural complications have been reported¹⁾. Nerve injury of the abdominal wall caused by XLIF can result in paresis and abdominal musculature bulging, which is called abdominal pseudohernia^{2,3)}. We describe a case of abdominal pseudohernia following XLIF and review the relevant literature. In this case, assessment of computed tomography (CT) imaging during periodical observation demonstrated the improvement of the abdominal wall muscle thickness.

An 83-year-old man was referred to our hospital with complaints of low back pain with bilateral radiating posterior leg pain. Radiographs and CT imaging revealed lumbar degenerative kyphoscoliosis (Fig. 1A, B). In addition, magnetic resonance imaging revealed L2-L4 canal stenosis. Combined anterior-posterior surgery was planned for the correction of global malalignment and decompression of canal stenosis. The patient underwent XLIF at four disc levels, as well as posterior decompression and fixation (Fig. 1C, D). Briefly, the external oblique fascia was cut using scissors. Then, the muscular layers of the external and internal obliques and the transversus abdominis were bluntly dissected. No nerves were identified in the surgical field of the abdominal wall during the approach and wound closure.

The postoperative course was uneventful. At 3 months

following surgery, the patient complained of left abdominal flank discomfort, and bulging was observed near the skin incision of XLIF (Fig. 2A). Abdominal CT revealed no abdominal wall defect or hernia. The left abdominal wall muscles were thinned and had asymmetrical thickness in comparison with the right abdominal wall (Fig. 3A). Consequently, he was diagnosed with abdominal pseudohernia. We continued periodical observation, and it naturally disappeared at 1 year following surgery (Fig. 2B). Abdominal CT at 1 year following surgery confirmed a symmetrical abdominal wall and that the muscles had recovered to an almost normal thickness (Fig. 3B).

Injury to the nerves that regulate the abdominal muscles, such as the subcostal, iliohypogastric, and ilioinguinal nerves, may cause denervation, paresis, and bulging of the anterior abdominal wall. This complication is referred to as “abdominal pseudohernia”^{2,4)}. Whereas a patient with incision hernia present bulging or protrusion of the abdomen due to the defect in the fasciae of the abdominal wall, a patient with abdominal pseudohernia has no real dehiscence of the abdominal muscles. One of the main causes of abdominal pseudohernia is iatrogenic injury during surgery. In addition, nerve root compression from a herniated disc⁵⁾, diabetic neuropathy⁶⁾, and infectious neuropathy (due to conditions such as herpes zoster⁴⁾ and Lyme disease⁷⁾) have also been reported to cause this complication in previous studies. The most common surgery causing abdominal pseudohernia is gynecological surgery, the incidence of which is 3.7%⁸⁾. Our patient developed abdominal pseudohernia following XLIF,

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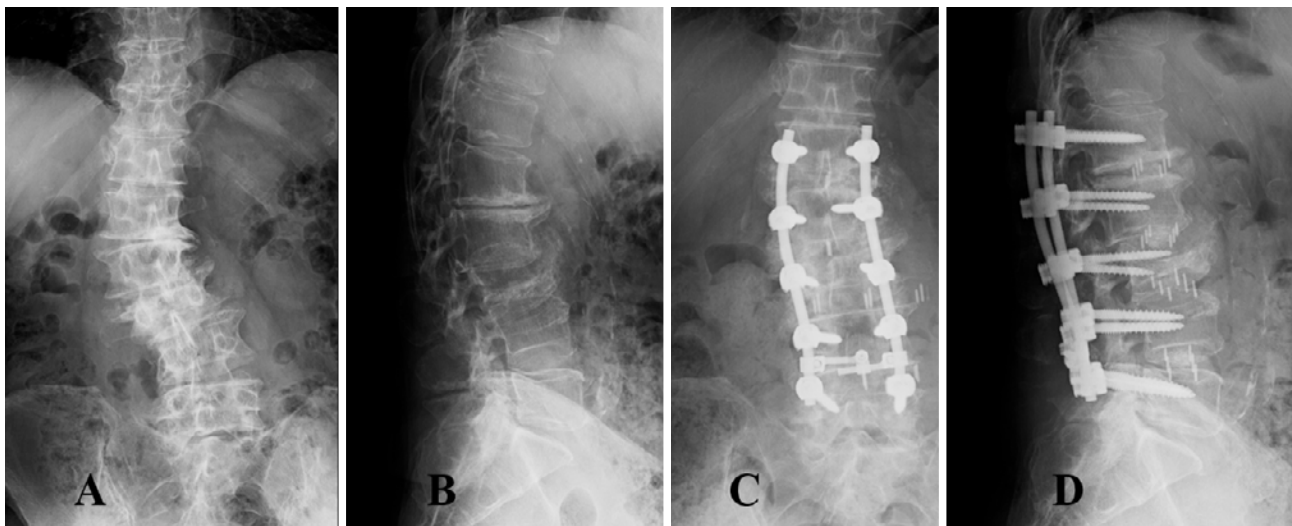


Figure 1. Preoperative radiographs of the lumbar spine showing degenerative kyphoscoliosis (A: anterior–posterior view; B: lateral view). Postoperative radiographs of the lumbar spine (C: anterior–posterior view; D: lateral view).

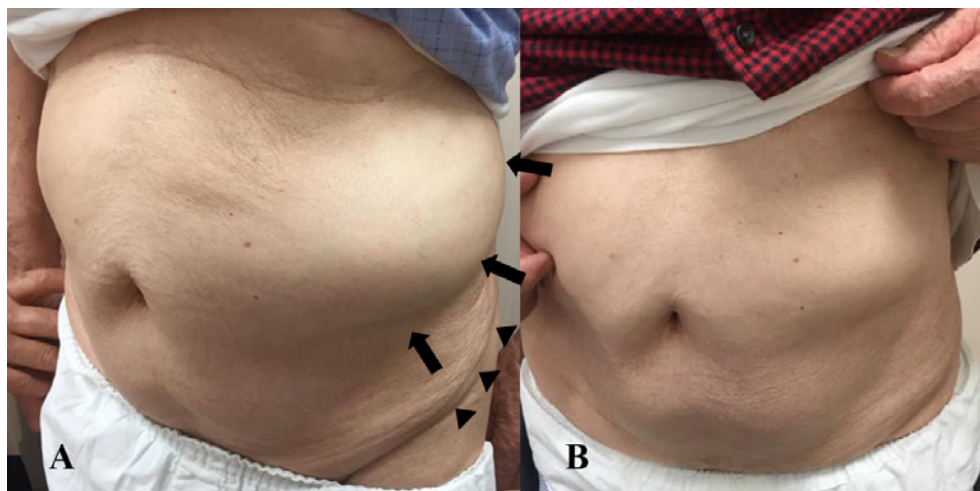


Figure 2. (A) A picture obtained 3 months following surgery showing the bulging mass (arrows) in the anterolateral abdominal wall, close to the lateral surgical incision (arrowheads). (B) A picture obtained 1 year following surgery showing the natural disappearance of the mass.

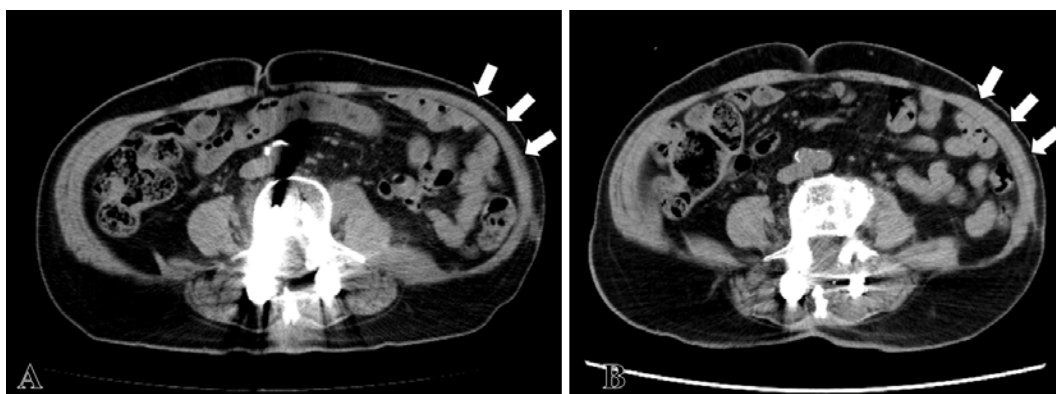


Figure 3. (A) An axial computed tomography image showing the thinned abdominal wall muscles at 3 months following surgery. There was no abdominal wall defect or hernia. There was abdominal wall bulging due to the abdominal contents. (B) An axial computed tomography image showing the symmetrical abdominal wall with recovery of the muscle thickness.

which is not well recognized among spine surgeons. The incidence of abdominal pseudohernia following XLIF might be underestimated because outpatients rarely complain of abdominal symptoms to spine surgeons. As the Lateral Lumbar Interbody Fusion (LLIF) procedure through mini-open with a retractor has increased, more attention should be paid to this complication. In the systematic analysis of lumbar plexopathies and nerve injury following LLIF, approach-related nerve injury was reported secondary to direct mechanical compression, laceration, stretch/traction, and indirect ischemia⁹⁾. It was reported that abdominal pseudohernia would indicate injury to and/or irritation of the nerve outside of the psoas muscles. In this case, we observed spontaneous recovery of the abdominal wall thickness by consecutive CT, which was never confirmed in previous reports, suggesting that the damage to the nerves was not neurotmesis but neurapraxia or axonotmesis.

The clinical course of the abdominal pseudohernia following XLIF remains unknown. Dakwar et al. described the largest series of abdominal pseudohernia following LLIF, in which the incidence was 1.8% (10/568)³⁾. In their study, all patients with abdominal pseudohernia underwent conservative treatment, and eight (80%) of them completely recovered. However, two case reports described cases in which abdominal pseudohernia following LLIF did not improve with conservative treatment^{2,10)}. Jeong et al. described the CT scan findings showing abdominal flank bulging accompanied by abdominal muscle thinning¹⁰⁾, which were similar to this present case. The mechanism for abdominal thinning was speculated as follows. First, denervation of the abdominal muscles caused muscle atrophy. Second, the abdominal wall was easily stretched by intra-abdominal pressure due to the decrease in muscle tone following denervation. Surprisingly, in a previous case report, surgical repair with transversalis fascia plication and mesh insertion yielded good result with no recurrence after a 6-month follow-up²⁾. Although previous studies revealed that most cases resolved with conservative treatment, a further large-scale study is warranted to examine the clinical course of abdominal pseudohernia.

Although abdominal pseudohernia is a rare complication following XLIF, spine surgeons should pay attention to its occurrence during the postoperative course. As spontaneous improvement is expected in most cases, careful observation is recommended.

Conflicts of Interest: The authors declare that there are

no relevant conflicts of interest.

Ethical Approval: None

Author Contributions: Taiki Yasukawa wrote and prepared the manuscript, and all the authors participated in the study design. All authors have read, reviewed, and approved the article.

Informed Consent: Informed consent was obtained from all study participants.

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