Anterior Longitudinal Ligament Avulsion Fracture when Changing the Patient's Position from Lateral to Prone during Extreme Lateral Interbody Fusion: A Case Report

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Lateral lumbar interbody fusion (LLIF) is used to treat various pathological conditions because it reduces surgical invasiveness and bleeding and has an indirect decompressive effect, with strong corrective force[1)]. However, a drawback is the complication rate, which is reported to be as high as 26.7%[2)]. Reported complications include abdominal problems, neurological symptoms, psoas weakness, vascular injury, and anterior longitudinal ligament (ALL) injury[3)]. ALL injury is usually not detected intraoperatively but becomes evident after surgery[4)]. We encountered a case of anterior opening due to an ALL avulsion fracture when changing the patient's position from lateral to prone during extreme lateral interbody fusion (XLIF) surgery.

A 72-year-old woman presented to our hospital after several years of low back pain, pain in the right buttock and lateral thigh, and intermittent claudication, with no muscle weakness. Magnetic resonance imaging showed canal stenosis at L3/4 (Fig. 1), while X-ray imaging showed L3/4 lateral disk mobility of 3° and lumbar kyphosis. Computed tomography (CT) revealed osseous bridging of the vertebrae from L2 to L3 and from L4 to the sacrum.

We planned XLIF at L3/4 and lumbar fixation from L2 to L5 using percutaneous pedicle screws (PPSs). XLIF at L3/4 was performed in the right lateral position. A cage, with a height of 9 mm, was inserted, with no complications. Next, we changed the patient's position from lateral to prone. Fluoroscopy then revealed an anterior opening at L3/4 (Fig. 2). To apply compression more easily to the opening, we switched to open surgery for pedicle screw insertion. After inserting the screws, we applied compression at this level. Postoperative CT images revealed an ALL avulsion fracture (Fig. 3). As of 1 year later, the postoperative course has been excellent.

The frequency of ALL injury during anterior-posterior correction of spinal deformity by LLIF is as high as 21.1%-41.2%[4-6)]. ALL injuries are more likely to occur in cases where the disk height is ≤5 mm, the cage is placed anteriorly, or the deformity is strongly corrected[4,5,7)]. ALL injury may result in reduced anterior support and increase the risk of nonunion and rod breakage. Although most cases occur during corrective posterior surgery, ALL injury can also occur when a cage is inserted during anterior surgery[4-6)]. ALL rupture should be suspected if interbody tension disappears during the interbody procedure. In this case, we were able to feel the tension of the ALL during anterior surgery. To our knowledge, there have been no reports of ALL avulsion fracture due to a positional change in the patient.

The problem with the fusion of several vertebrae is that the mobility of the spine is reduced, and mechanical stress tends to concentrate in areas where the continuity of ligament ossification is interrupted. In our case, due to the osseous bridging of the vertebrae from L2 to L3 and from L4 to the sacrum, it is likely that mechanical stress at L3/4 after the positional change.

Considering the cause of the stenosis at L3/4 and the presence of lumbar kyphosis and osteoporosis, we antici-

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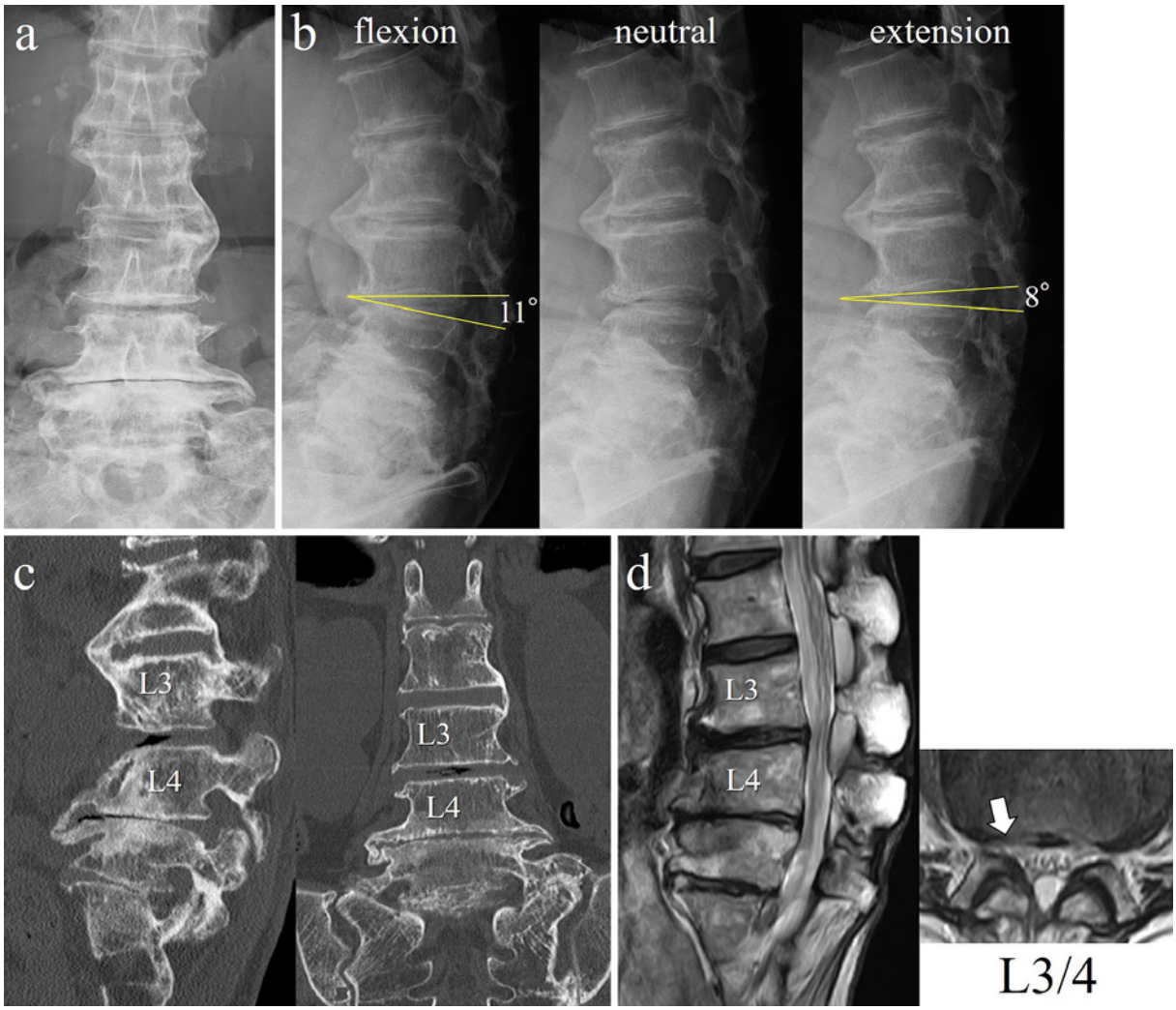

Figure 1. Preoperative plain X-ray images: (a) anteroposterior view and (b) lateral view in flexion, neutral, and extension, with a 3° L3/4 lateral disc mobility between flexion and extension; (c) computed tomography scans showing osseous bridging of the vertebrae from L2 to L3 and from L4 to the sacrum; (d) preoperative sagittal T2-weighted magnetic resonance images, showing lumbar spinal canal stenosis at L3/4, and magnetic resonance imaging in the axial plane, showing lateral recess stenosis on the right side (arrow).

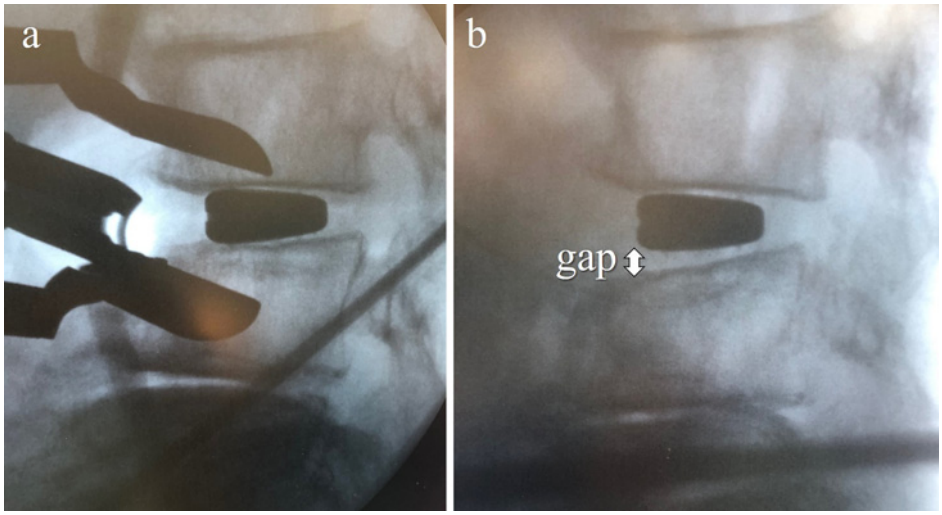

Figure 2. (a) The image acquired when the intervertebral cage was inserted before changing the patient's position. No anterior opening at L3/4 is evident. (b) The image obtained after changing the patient's position from lateral to prone reveals anterior opening at L3/4 and a gap between the intervertebral cage and endplate.

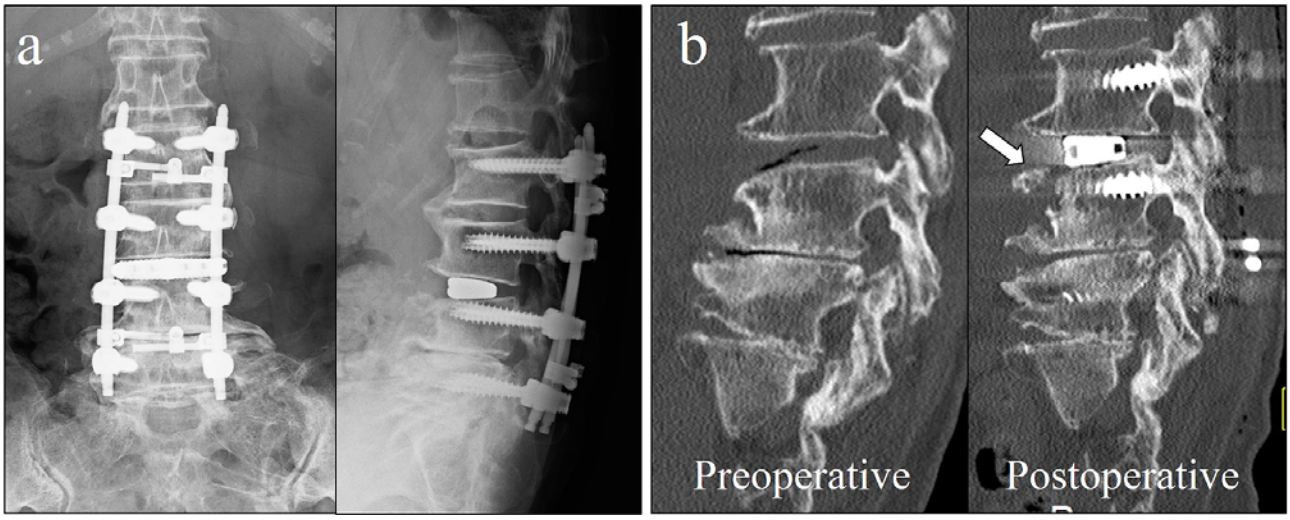

Figure 3. (a) Postoperative radiographs confirming that adequate compression was applied at L3/4 and that there was contact between the intervertebral cage and the endplate. (b) Preoperative and postoperative sagittal computed tomography images, with the postoperative image showing an avulsion fracture of the anterior longitudinal ligament (arrow).

pated that decompression alone would be insufficient; thus, XLIF at L3/4 and lumbar fixation from L2 to L5 was planned. As in most facilities, we routinely insert the PPS with the patient in the prone position because insertion is easier. However, retrospectively, we believe that the ALL injury in this case could have been avoided by inserting the PPS with the patient in the lateral position. Furthermore, sufficient attention should be given to the selection of cage size and installation position. In this case, 9 mm may have been too large for the patient. Surgeons should be aware that such complications can occur and check the fluoroscopic images very carefully when repositioning the patient.

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