Anterior Column Reconstruction Performed for Complete Anterior Longitudinal Ligament Rupture Caused by Surgical Correction with Lateral Interbody Fusion for Kyphosis

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Lateral interbody fusion (LIF) provides a minimally invasive and efficient fusion. Despite its advantages[1,2], various complications exist[3]. Anterior longitudinal ligament (ALL) rupture accompanying cage installation[4] has been reported, but not its successful reconstruction. We report a case of ALL rupture during kyphosis correction, which was reconstructed using allograft and mesh cage.

A 78-year-old woman underwent L4/5 posterior decompression 6 years ago. Gradual progression of kyphosis led to low back pain and difficultly in standing (lumbar lordosis [LL]: −3°; pelvic incidence [PI]: 38°; pelvic tilt [PT]: 44°; sagittal vertical axis [SVA]: 42 mm; and thoracic kyphosis [TK]: 37°) (Fig. 1).

Adult spinal deformity (ASD) was diagnosed, and L2/3/4/5 LIF and posterior fusion from lower thoracic vertebrae to pelvis were performed. LIF was performed using XLIF (NuVasive, San Diego, CA USA). After LIF, X-ray revealed no abnormalities (Fig. 2a). However, when cantilever force was applied from the posterior, L2/3 anterior interbody angular dilation and cage dislodgement occurred (Fig. 2b). ALL rupture was considered due to the correction. We were concerned about the rod breakage, and surgery was concluded after posterior triple rod reinforcement (Fig. 2c). Anterior reconstruction was performed 1 week later. Reoperation revealed complete ALL rupture. The mesh cage with allograft fitted to the defect (Fig. 3a, b).

The following resulted postoperatively: LL 35°; PI 38°; PT 23°; SVA −13 mm; and TK 37° (Fig. 4a, b). Low back pain resolved. She ambulated with a cane at 2 months postoperatively and was discharged. Eighteen months postoperatively, the cage was fitted and progress of bone fusion was observed on X-ray and computed tomography (Fig. 4c, d).

Advantages of LIF include excellent alignment and indirect decompression and high bone fusion rate. However, various complications, such as ALL, great vessel, intestinal, and vertebral endplate injuries, have been reported[1,2]. Joseph et al. have reported ALL injury (22.3%) to be highly frequent complications[5]. Tatsuno et al. reported that in 34 patients of ASD using LIF, ALL rupture occurred in 14 (41.2% and ALL damage could not be diagnosed on X-ray after LIF, which was diagnosed only after reoperation from the posterior[4]. In our case, radiography after LIF did not reveal cage dislodgement, but X-ray after posterior correction confirmed L2/3 dilation and complete cage dislodgement. Therefore, ALL in which extension or partial rupture occurs during LIF are further strained by posterior correction, resulting in complete rupture.

When ALL rupture occurs, local instability occurs due to decreased anterior support, resulting in postoperative risk of nonunion and rod breakage[6]. Tatsuno et al.[4] reported that although bone fusion at 6 months postoperatively is prolonged, some degree of fusion is achieved. In cases of suspected partial rupture, follow-up observation also is an option. We have previously treated a patient with anterior interbody dilation during posterior correction. At our hospital, follow-up observation is performed when contact between the cage and interbody is maintained with mild anterior dilation that appears as a partial rupture. Presently, there are no problems with bone fusion. Complete rupture of ALL with a large anterior dilation needs an anterior column reconstruc-

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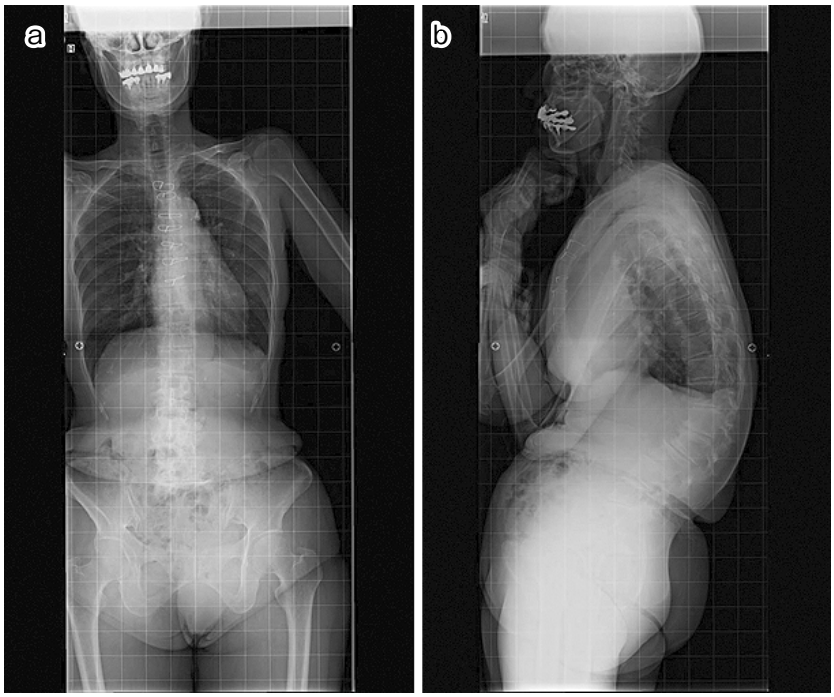

Figure 1. Full-length X-ray at initial visit: (a) frontal view and (b) lateral view. Following L4/5 decompression, no slippage or instability was noted. LL: −3°; PT: 44°; PI: 38°; SVA: 42 mm; TK: 37°.

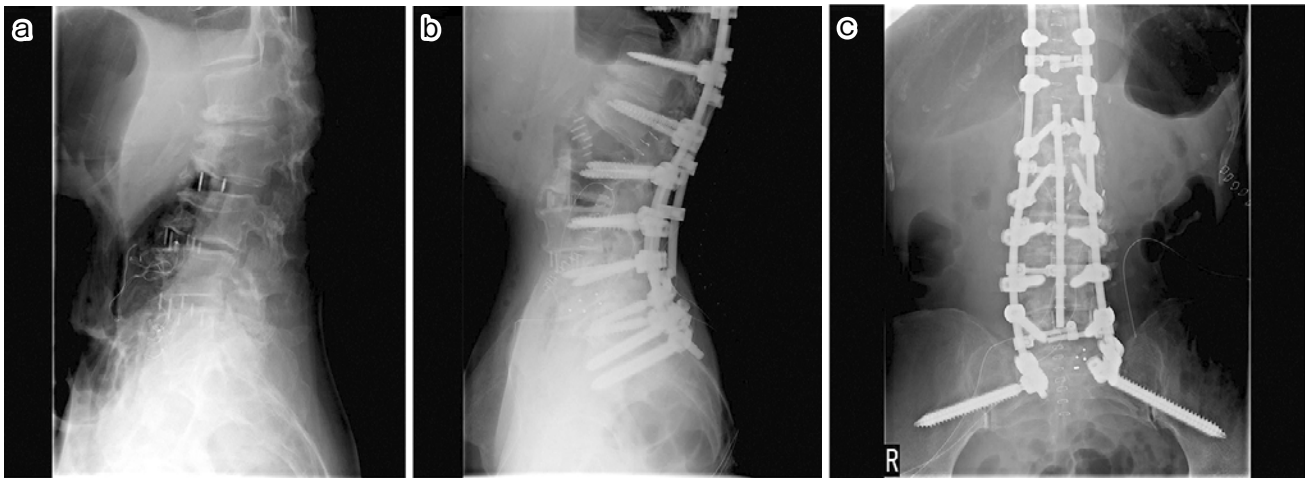

Figure 2. (a) Lateral plain X-ray after LIF. No dilation of the anterior interbody angle and dislodgement of the cage were observed during LIF. (b) Lateral X-ray at conclusion of posterior fusion. Dilation of the anterior interbody angle on L2/3 and dislodgement of the cage were observed. (c) Frontal X-ray at conclusion of primary surgery. The posterior region was reinforced with a triple rod.

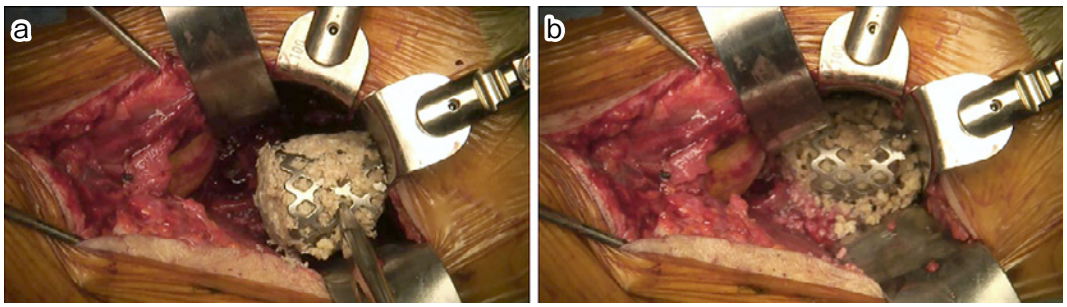

Figure 3. (a) The mesh cage. (b) Intraoperative X-ray after mesh cage insertion.
A mesh cage was molded in accordance with the defect, filled with allograft, and inserted into the defect.

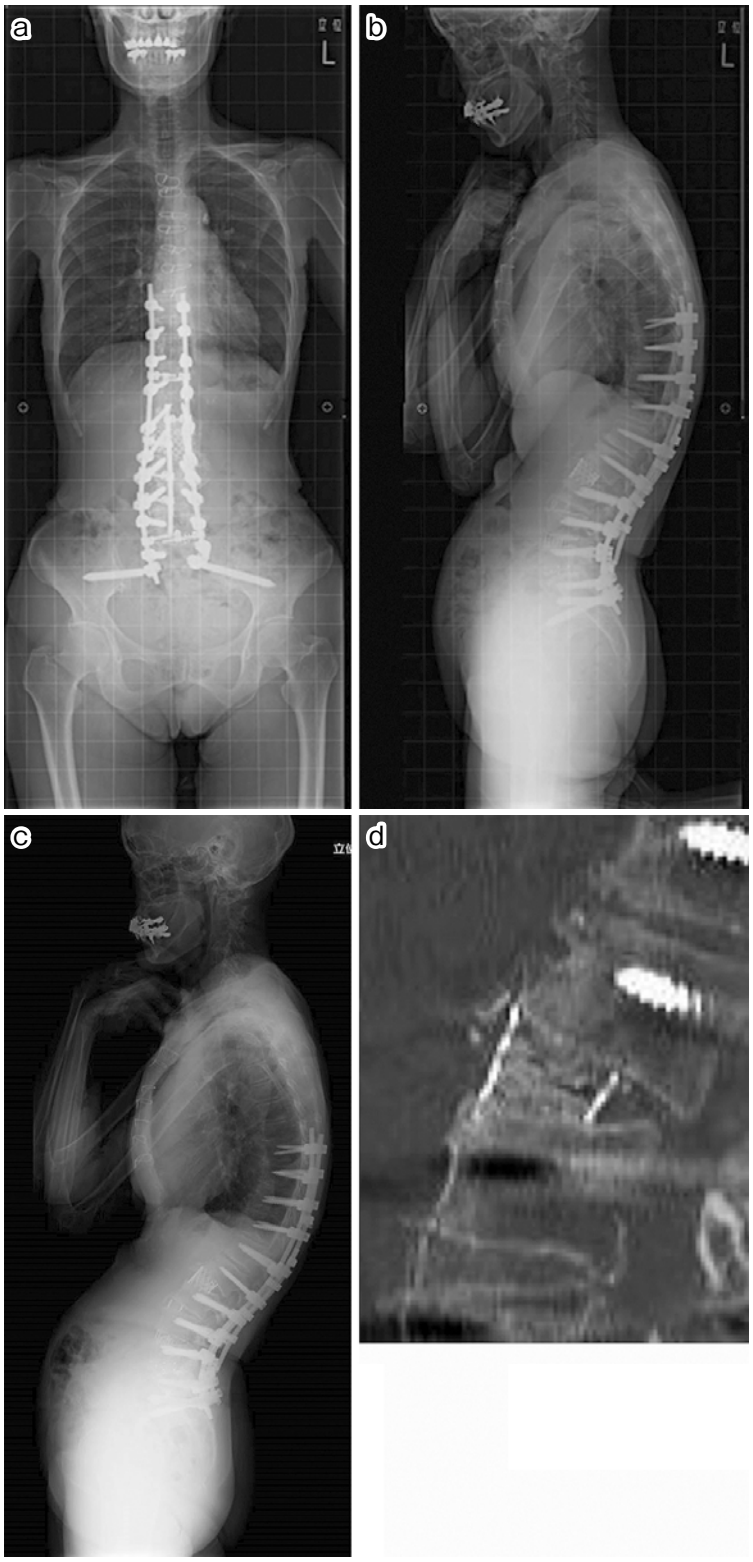

Figure 4. Postoperative full-length X-ray: (a) frontal view and (b) lateral view. LL: 35°; PT: 28°; PI: 38°; SVA: −13 mm; TK: 37°. These indicated favorable alignment. (c) Full-length X-ray at 18 months postoperatively, lateral view. (d) Plain CT at 18 months postoperatively, sagittal view. The cage fit the defect and progress of bone fusion was observed.
CT: computed tomography

tion. However, compensating for defects using existing cage is difficult. In our case, posterior triple-rod reinforcement and anterior column reconstruction using mesh cage provided favorable outcomes at 18 months postoperatively. Originally, assessment of spinal fusion and implant failures requires longer clinical follow-up of more than 2 years.

Mesh cage can be freely molded and reliably fit to the defect, improving stability and fusion rate. This approach may be effective for ALL rupture with an obvious risk of decreased support.

When the defect is large and cannot be compensated by existing implant, anterior column reconstruction using mesh cage could be effective.

Conflicts of Interest: The authors declare that there are no relevant conflicts of interest.

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