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Magnetic Resonance Imaging-Based Evaluation of Healing Status and Injury Sites of the Acromioclavicular Ligament Complex and Their Association with Reduction Loss after Hook Plate Fixation

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Introduction and Background

A limitation of hook plate (HP) fixation for treating acromioclavicular (AC) joint dislocations is reduction loss after plate removal. While the healing of the coracoclavicular (CC) ligament is generally reliable after HP fixation, the healing status of the acromioclavicular ligament complex (ACLC) remains less understood. Our hypothesis was that ACLC healing failure would increase the risk of reduction loss.

Material and Method

Patients who underwent HP fixation within 2 weeks of injury and had preoperative and post-HP removal magnetic resonance imaging (MRI) from May 2018 to May 2023 for acute Rockwood type III or V AC joint dislocations were retrospectively reviewed. Reduction loss was defined as a coracoclavicular distance (CCD) ratio (CCD of the injured side / uninjured side \times 100) greater than 150 at final follow-up. Ligament healing was assessed using the Ihara grade, with grades 1 and 2 considered healed. The tear sites of the ACLC were identified with bony attachment and mid-substance site.

Results

A total of 33 patients were included. CC ligaments healed in all cases. The mean follow-up period was 11.8 ± 4.1 months. The mean time to HP removal was 3.4 ± 0.8 months postoperatively. ACLC healing was observed in 21 patients, and non-healing in 12 patients. Reduction loss was significantly more frequent in the non-healing group (83.3%, 10 / 12) than in the healing group (23.8%, 5 / 21) (OR, 16.0; 95% CI, 2.59–98.77; $p = 0.001$). The ACLC healing failure rate was significantly higher in the bony attachment tear group (52.6%, 10 / 19) than in the mid-substance tear group (14.3%, 2 / 14) (OR, 6.67; 95% CI, 1.16–38.94; $p = 0.024$). Reduction loss was also significantly more frequent in bony attachment tears (63.2%, 12 / 19) than in mid-substance tears (21.4%, 3 / 14) (OR, 6.29; 95% CI, 1.29–30.54; $p = 0.017$).

Conclusions

Reduction loss after HP fixation for treating AC joint dislocations was associated with the healing status and tear sites of the ACLC. Particularly, bony attachment site tears demonstrated lower healing potential and a higher risk of reduction loss, suggesting that additional procedures beyond HP fixation should be considered when such tears are identified preoperatively on MRI.

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Figure & Table 1.

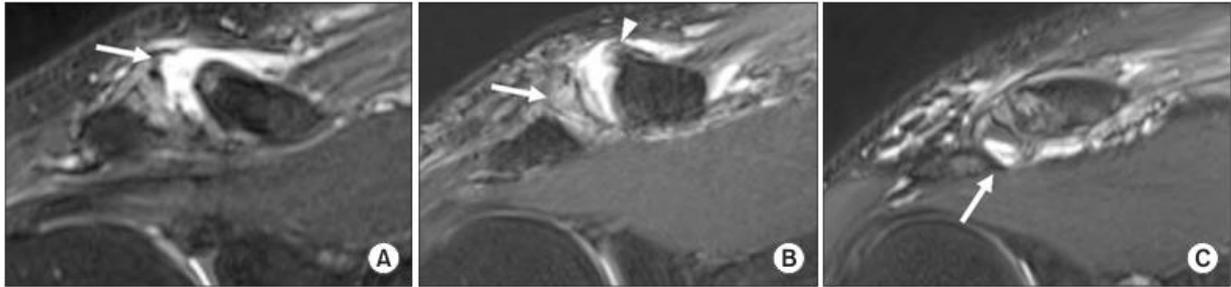


Fig. 3. Preoperative coronal proton-density weighted magnetic resonance images of a ruptured acromioclavicular ligament complex. (A) A clavicular-sided injury is depicted by the absence of any attached tissue at the clavicular tear site (white arrow), with high signal intensity. (B) A mid-substance injury represents soft tissues attached to the bony attachment site (white arrow and arrowhead), with a space of high signal intensity in the mid-substance. (C) An acromial-side injury is depicted, with the white arrow indicating acromial-sided detachment.

Figure & Table 2.

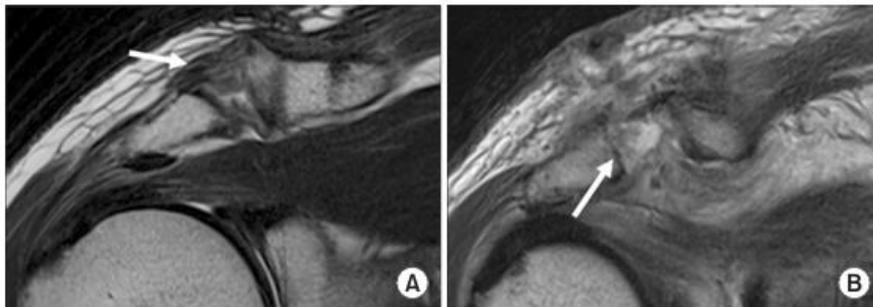


Fig. 2. Post-hook plate removal T2-weighted magnetic resonance images. The healing grade of the acromioclavicular ligament by Ihara. (A) The white arrow shows the integrity of the healed acromioclavicular ligament complex. (B) The white arrow depicts a non-healed acromioclavicular ligament complex.

