

Editorial Commentary: Double Bundle the Coracoclavicular Ligaments for Success: The More the Better?



Jorge Chahla, M.D., Ph.D., Editorial Board, and Mark E. Cinque, M.D., M.S.

Abstract: Injuries to the acromioclavicular joint are common across all levels of sport and activity. Overall, a consensus exists regarding Rockwood grade I and II injuries (conservative approach) and Rockwood grades IV to VI (best treated surgically). However, grade III injuries are heterogeneous and thus respond differently to nonoperative and operative treatment. Regardless of the acromioclavicular injury grade, these are widely prevalent injuries, and there is a lack a consensus as to which operative fixation methods yield the best outcomes for patients. Although K-wires and plates were historically used to achieve rigid fixation, recent evidence supports the use of soft tissue grafts to reconstruct the coracoclavicular ligaments and restore vertical and anteroposterior and rotational stability with a more biological approach.

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In the article by Park, Itami, Hedayati, Bitner, McGarry, Lee, and Shin¹ entitled “Biomechanical Analysis of Single-, Double-, and Triple-Bundle Configurations for Coracoclavicular Ligament Reconstruction Using Cortical Fixation Buttons With Suture Tapes: A Cadaveric Study,” the authors performed a laboratory study comparing the acromioclavicular (AC) joint stability of single-bundle (SB), double-bundle with an anterior lateral limb, double-bundle with a posterior lateral limb, and triple-bundle coracoclavicular (CC) ligament reconstructions using cortical fixation buttons with suture tapes. The premise of the study was based on evidence from previous clinical studies of SB CC ligament reconstruction using a cortical button fixation that demonstrated as high as 23% to 50% loss of reduction on radiologic images. This rate of loss of reduction is significantly higher than reported in double-bundle CC ligament reconstructions, which have demonstrated a 4.8% reduction loss after 2 years of follow-up.²⁻⁵ To evaluate which fixation method was

biomechanically superior, the authors used 8 cadaveric specimens and evaluated AC joint translation and rotational stability using a 3-dimensional system, after each of the 4 fixation methods. With regard to AC joint translation, the authors examined native and reconstructed AC joint anteroposterior (AP) and superior-inferior translation using 10 and 15 N loads. Similarly, rotational forces were applied across native and reconstructed AC joints with both 0.16 and 0.32 Nm of rotational torque.

After testing, the authors found that the double-bundle with a posterior lateral limb reconstruction showed significantly better AP stability compared with SB and double-bundle with an anterior lateral limb reconstruction at 10 and 15 N ($P < .001$). Additionally, the authors found that the degree of total rotation showed a tendency to decrease according to increasing number of bundles; however, these differences were not statistically significant. The authors concluded that an additional posterolateral clavicular hole for CC ligament reconstruction using cortical fixation buttons with suture tapes resulted in better AP stability compared with SB reconstruction.

As highlighted by the authors, there are limitations to the findings of this study. The authors drilled the lateral clavicular hole at a constant distance from the medial clavicular hole, not at an average position considering the total clavicle length. Although this does not take

Redwood City, California (M.E.C.).

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into account anatomic variables, this limitation does not appear to be catastrophic to the present study given that the authors' reported distance from lateral clavicular edge to both the medial and lateral clavicular holes was close to those previously reported in the literature.⁶⁻⁹

Achieving stable fixation after injury to the CC joint is vital in allowing athletes to return to a high level of sport and "weekend warriors" to the activity level at which they desire to function. The understanding of the CC ligament anatomy has evolved over the past decade. The CC ligaments' footprint on the clavicle is broad, and therefore recreating its footprint with a single point of fixation during CC ligament repair has been associated with loss of reduction and inferior function.^{2,6,8,9} Double-bundle AC joint reconstruction provides significantly better restraint to AP translation and trends toward superior rotational control compared with SB reconstruction.¹

There is a broad spectrum of surgical treatments of AC joint instability. Some of the most common techniques in the literature include transfer of the coracoacromial ligament or conjoint tendon, hook plate, screw fixation, temporary pin fixation, suture-button system, soft tissue grafts, and synthetic grafts. In a recent systematic review of AC and CC ligament reconstruction techniques and outcomes, Moatshe et al.⁹ reported that improvements in subjective and objective outcomes after surgical treatment of AC joint dislocation could be achieved at a minimum 2 years of follow-up. Specifically, the authors reported on 165 patients who underwent reconstruction with CC ligaments using free tendon grafts. Only 2 studies reported a CC distance side-to-side difference of 0.2 and 1.7 mm on nonstress radiographs, and 1 study reported a side-to-side difference of 1.1 mm with 4-kg stress radiographs. Only 3 studies reported on only the postoperative CC distance on the injured side ranging from 13.3 to 15.6 mm.⁹

Taking the existing AC joint literature with the findings from the present study into consideration, the authors should be congratulated for producing clinically relevant findings for a very common orthopaedic pathology for which there is no current accepted algorithm. The findings of the present study demonstrate that a double-bundle AC joint reconstruction provides significantly better restraint to AP translation and trends toward superior rotational control compared with SB reconstructions. These findings may help to decrease the relatively high reoperation rate reported in the AC joint reconstruction literature.⁹ As previously noted, there are many ways to treat symptomatic AC joint instability, with more than 150 variations reported

in a recent systematic review.¹⁰ Despite these surgical options, no reconstruction technique can duplicate the stability and physiology of a native, intact AC joint complex.¹¹ Future studies should focus on long-term outcomes of coracoacromial ligament reconstructions, following both objective (AP and rotational stability) and subjective patient outcomes.

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