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TECHNIQUE

Arthroscopic Acromioclavicular Joint Repair: A Modified Technique

Jarrad A. Merriman, MPH, Diego Villacis, MD, and Reza Omid, MD

Abstract: As of yet, there is no consensus on the technique for repairing acute high-grade acromioclavicular joint disruptions. Several minimally invasive arthroscopic techniques that avoid the large incision associated with open reconstruction have been described. Previously described arthroscopic techniques require substantial (≥ 4 mm) drill holes for suture or graft passage through the coracoid process and clavicle. This potentially produces an increased risk for both traumatic and atraumatic fractures of the coracoid and the clavicle. We present a novel arthroscopic technique utilizing a 2.4-mm Beath pin under arthroscopic guidance with subsequent fixation utilizing a FiberTape and Endobutton hybrid fixation device.

Key Words: acromioclavicular joint, AC joint, AC dislocation, arthroscopic repair, AC joint repair

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Acute acromioclavicular (AC) joint disruption is a common orthopedic injury, representing 40% to 50% of athletic shoulder injuries.[1,2] A long source of debate has been the optimal management of type III injuries. The tendency in management has been toward minimal intervention.[3] However, surgical treatment in the form of coracoclavicular fixation and/or ligament reconstruction is being considered on a case-by-case basis after accounting for patient age, activity level, occupation, and chronicity of injury.[4] The recent literature has demonstrated a decreased rate of scapular dyskinesis in patients with type III AC joint injuries following surgical treatment.[5] Acute injuries are amenable to ligamentous healing; thus, good results with suture and button constructs without additional biological grafting have been described in the literature.[6,7] Traditional open AC surgical techniques require large incisions and partial disruption of the deltoid for exposure of the coracoid. This has led to the development of various arthroscopic or arthroscopic-assisted techniques that allow for improved visualization, less extensive soft tissue dissection, and smaller incision.[8–13] Often these reconstruction techniques rely on drilling substantial tunnels through the clavicle and/or coracoid for suture passage. The creation of multiple tunnels in the clavicle and/or coracoid raises concern for potential fracture,[12,13] and this concern has been in fact realized with several reports in the literature.[16–19] In this article, we present a novel arthroscopic technique for surgical treatment of acute AC joint disruption using a hybrid fixation device consisting of FiberTape (Arthrex, Naples, FL) secured with Endobuttons (Smith&Nephew, London, UK). The hole in both the clavicle and coracoid is created using a 2.4-mm Beath pin, minimizing the potential risk of fracture.

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The authors declare no conflict of interest.

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SURGICAL TECHNIQUE

Under general anesthesia, the patient is placed in a beach chair position using a Spider Limb Positioner (Tenet Medical, Calgry, AB). The patient's affected extremity is prepped and draped in a sterile manner. Once a surgical time-out is performed and perioperative antibiotics are given, a posterior portal is established. A diagnostic arthroscopic procedure is performed to rule out any concomitant glenohumeral pathology.

After surveying for potential adjunctive injuries, an anterior portal is established through the rotator interval. Utilizing the anterior portal, the rotator interval is debrided using electrocautery and shaving devices to gain circumferential exposure of the coracoid (Fig. 1). Once the coracoid is outlined, 30- and 70-degree scopes are utilized to delineate the edges of the coracoid while releasing the coracoacromial and coracohumeral ligaments from their origins. The objective is to obtain unobstructed visualization of the superior and inferior surfaces of the coracoid through which the drill hole will be made. Next, with spinal needle visualization, an anterolateral accessory portal is established. Through both the posterior and anterolateral portals, the anterior bursa is debrided until the undersurface of the clavicle is identified and the base of the coracoid is further exposed.

Using a freehand technique (no drill guide) in a superior to inferior orientation, under direct arthroscopic visualization, a 2.4-mm Beath pin is used to drill through the center of the coracoid, approximately 1 cm proximal to the tip (Figs. 2A–C). Extreme caution is taken to avoid damaging neurovascular structures inferior to the coracoid. In the same manner as the Beath pin, an accu-pass suture shuttle (Smith&Nephew) is advanced under arthroscopic visualization through the coracoid. An arthroscopic suture grasper delivers the suture out through the anterior portal. The suture is used to pass a fibrin link through the coracoid for use as a more reliable and robust passing mechanism. An arthroscopic suture grasper is used

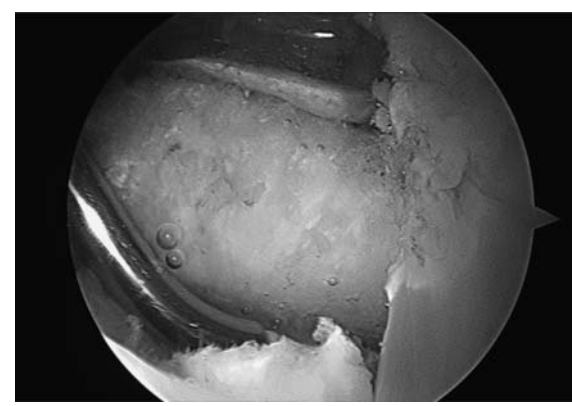

FIGURE 1. Circumferential exposure of the coracoid.

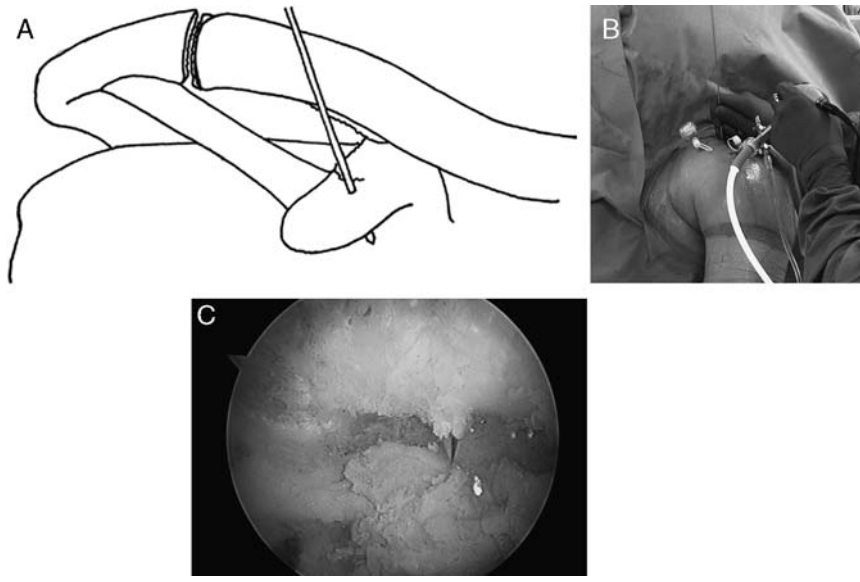

FIGURE 2. A, Illustration of a 2.4-mm Beath pin insertion through coracoid. B, Freehand technique for insertion. C, Beath pin exiting through center of coracoid approximately 1 cm proximal to the tip.

once again to deliver the fibrin link out through the anterior portal. Utilizing the fibrin link, a FiberTape and Endobutton hybrid fixation device is passed through the coracoid and flipped on the undersurface (Fig. 3).

Attention is then turned toward the subacromial space. For efficient and accurate subacromial debridement, a spinal needle is placed through the AC joint as a reference (Fig. 4). The undersurface of the clavicle is exposed to obtain visualization for a drill hole to be placed approximately 1.5 cm medial to the AC joint (Fig. 5). Next, the distal clavicle is identified and released from the surrounding tissue with an electrocautery device, so an anatomic reduction can be obtained. A 2.5 cm incision is then made over the clavicle, approximately 1.5 cm medial to the AC joint (Fig. 6). The 2.4-mm Beath pin is placed on the superior surface of the clavicle, and a hole is drilled under arthroscopic visualization. The existing FiberTape device is passed in a superior manner, using the suture shuttle, and delivered out through the superior surface of the clavicle. Arthroscopically, the FiberTape is visualized exiting the superior surface of the coracoid and entering the inferior surface of the clavicle (Fig. 7).

With the FiberTape pulled through the superior surface of the clavicle, dissection is carried down until the surface of the clavicle is identified, and soft tissue retractors are used to improve visibility. The circumferential bony surface around the hole in the clavicle is exposed so that the Endobutton can rest directly on the cortex. The FiberTape is threaded through the second Endobutton, which is pushed down onto the surface of the clavicle (Fig. 8). While an assistant holds manual downward pressure on the medial clavicle, the FiberTape is tied. Anatomic reduction is visualized from the undersurface of the clavicle arthroscopically. Repair of the AC joint is now complete (Fig. 9), the FiberTape is cut, and the skin is closed.

DISCUSSION

Acute AC joint disruption remains a diagnostic and therapeutic challenge. Historically, stabilization of the AC joint consisted of pin fixation across the joint or screw fixation between the clavicle and coracoid. These techniques have by and large been abandoned because of the potential catastrophic complication of pin migration or the need for later screw

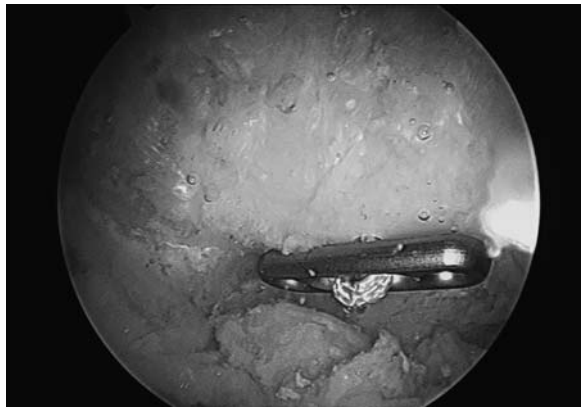

FIGURE 3. FiberTape and Endobutton hybrid fixation device on undersurface of coracoid.

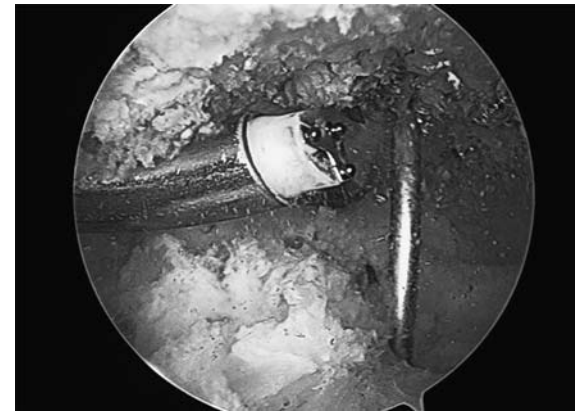

FIGURE 4. Spinal needle placed through the acromioclavicular joint as a reference.

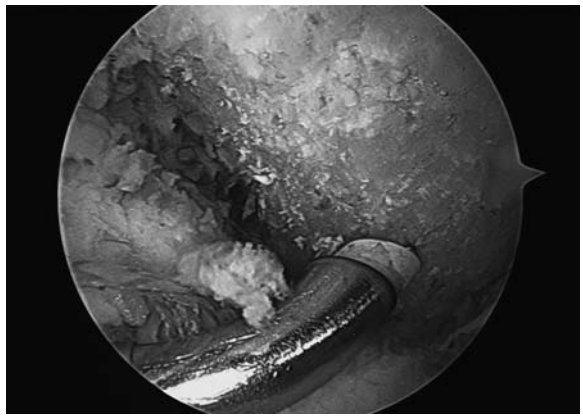

FIGURE 5. Exposure of undersurface of clavicle.

removal. The Weaver-Dunn procedure, first described in 1972, avoids the use of metallic fixation and is still used today. Unfortunately, it demonstrated failure rates as high as 28% and biomechanically was found to be much weaker then the native ligaments.[20,21] Subsequently, a vast array of techniques have been described in the literature utilizing biologic or synthetic fixation to more accurately restore the anatomy. Initial techniques focused on looping suture or graft around the coracoid and through the clavicle. However, this lead to reports of cutout at the base of the coracoid[17,18] and concern for anterior translation of the distal clavicle with loss of reduction.[22] These concerns combined with the desire for placement of fixation in an anatomically correct position to improve stability led to techniques utilizing graft or fixation devices through drill holes in the clavicle and the coracoid.[6,7,23–27] Struhl[27] describes an open technique utilizing an Endobutton (Smith&Nephew), similar to our technique, to reproduce the conoid portion of the coracoclavicular ligament with documented strength and stiffness of the device exceeding the native ligament complex by approximately 40%. Previous results from a similar technique using FiberWire (Arthrex) and an Endobutton demonstrated a concerning 50% failure rate in 8 patients attributed to failure of suture.[28] Our technique utilizes an ultra-high strength, 2 mm width FiberTape (Arthrex) with hopes of overcoming suture failure.

Open techniques often involve detachment and reattachment of the deltotrapezial fascia, which can cause

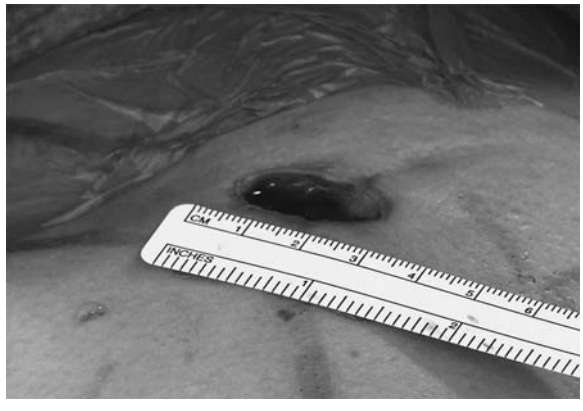

FIGURE 6. A 2.5 cm incision for Endobutton entry made over the clavicle approximately 1.5 cm medial to the acromioclavicular joint.

FIGURE 7. Visualization of FiberTape is visualized exiting the superior surface of the coracoid and entering the inferior surface of the clavicle.

postoperative weakness, and do not allow for the direct visualization of the coracoid base provided by arthroscopy. Therefore, a recent emphasis on utilization of arthroscopy has been observed. A vast number of arthroscopic or arthroscopic-assisted techniques have been described in the literature with several so fardemonstrating similarly good results to open fixation techniques.[8–13,29,30]

Clavicle fracture after AC joint repair is relatively uncommon. However, several reports in the literature have documented clavicle or coracoid fracture due to drill holes after AC joint repair or reconstruction.[16–19] A typical drill-hole size described in AC joint repair or reconstruction techniques is ≥ 4 mm.[8–13,29,30] At the point of the attachment of the coracoclavicular ligaments, the distal clavicle has an average width of 2 cm.[31] Our technique utilizes a 2.4-mm Beath pin to further minimize the risk for potential fracture.

Obtaining an anatomic reduction with stable fixation that allows the native ligaments to heal is the primary goal of acute AC joint stabilization. Our proposed arthroscopic technique utilizing a Beath pin with double Endobuttons and a FiberTape

FIGURE 8. FiberTape is threaded through the second Endobutton and pushed down onto the surface of the clavicle.

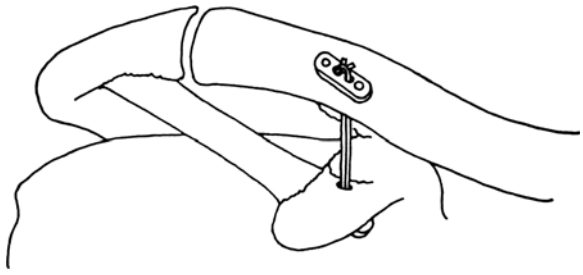

FIGURE 9. Illustration of final construct demonstrating reconstitution of conoid portion of coracoclavicular complex.

suture hybrid fixation allows for stable fixation of the AC joint, minimal trauma to the surrounding soft tissue, and minimizes the potential for clavicle or coracoid fracture as a complication. However, further biomechanical and clinical analysis is warranted to evaluate outcome, strength of fixation, and mode of failure for this technique.

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