



# Shoulder & Elbow Tips & Tricks: Arthroscopic-Assisted AC Joint Reconstruction

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## Background

Acromioclavicular (AC) joint injuries are a common injury seen in the young athlete<sup>1</sup>. It has been proposed that successful reconstruction of the AC joint requires restoration of normal anatomy. There are many surgical techniques available for the treatment of AC joint injuries including fixation with either a plate, wire or screw, coracoacromial ligament transfer, and reconstruction with a free tendon graft<sup>2</sup>. The decision for surgical technique is often predicated on surgeon preference but also relies heavily on the acuity of the injury. Use of tension band devices with suture buttons are often reserved for more acute injuries that are addressed within 4 to  $\pm$  weeks of injury. As these injuries become more subacute or chronic, the use of tendon reconstruction of the coracoclavicular (CC) ligaments is often recommended.

Reconstruction with free tendon graft provides an advantage over alternative techniques in that it has a load to failure equivalent to that of an intact CCligament<sup>3</sup>. Traditionally, this procedure is performed via an open approach, which requires a large incision and involves detaching the origin of the deltoid from the clavicle. An

arthroscopic-assisted approach eliminates these pitfalls while also allowing for clear visualization of the coracoid base, which is essential for graft passage<sup>2</sup>.

## Case Example

This is the case of a 29-year-old male who presents to clinic with right shoulder pain after a dirt bike crash sustained approximately 10 weeks prior. The mechanism of injury is described as landing directly on the right shoulder after the dirt bike slipped out from underneath him. There were no other injuries. He has no history of previous injury to his right arm.

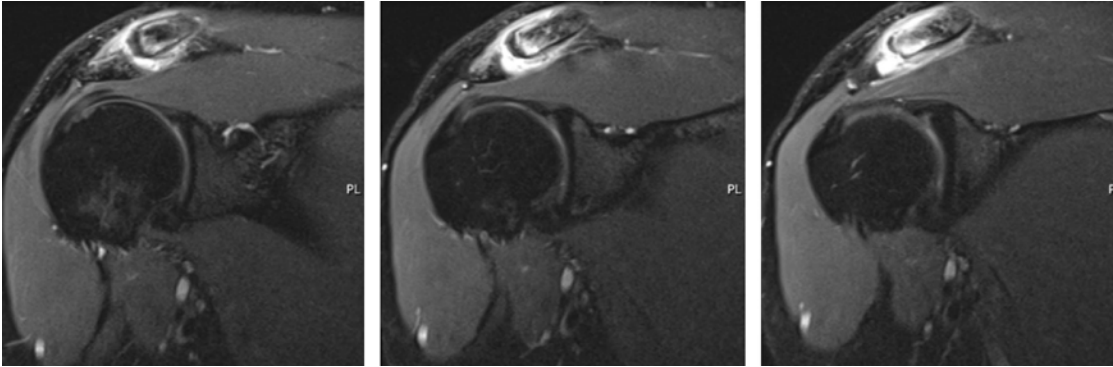
X-rays obtained in the ER initially showed no evidence of bony or ligamentous injury (Figure 1). A CT also obtained at the time of his visit to the ED were unremarkable. He was seen in the clinic of a nonoperative orthopaedic provider several weeks after the injury, at which time x-rays demonstrated interval AC joint displacement consistent with a Rockwood type III AC joint injury (Figure 2). A follow-up MRI obtained of his shoulder demonstrated superior subluxation of the distal clavicle at the AC joint, partial tearing of the inferior AC ligament and sprain of the CC ligament (Figure 3), consistent



**Figure 1.** Initial radiographs obtained upon initial presentation to the emergency department the day of injury demonstrate no obvious bony or ligamentous injury.



**Figure 2.** Follow-up radiographs obtained approximately two and a half weeks after the injury demonstrate interval widening of the acromioclavicular joint with almost 100% displacement of the coracoclavicular distance, consistent with a Rockwood Type III AC joint injury.



**Figure 3.** MRI of the right shoulder without contrast demonstrating partial tearing of the inferior AC ligament as well as a sprain of the CC ligaments with likely partial tearing of the trapezoidal ligament.

with radiographic findings. He was seen by a Sports surgeon 11 weeks after his injury at which time x-rays of bilateral AC joints demonstrated a Type III AC joint injury (Figure 4). He was subsequently referred to our clinic.

Upon presentation physical exam was notable for a prominence over the AC joint with superior displacement of the distal clavicle relative to the acromion. There was no appreciable skin tenting present. The patient endorsed significant tenderness to palpation overlying the AC joint. The AC joint was mobile and reducible. Range of motion was notable for external rotation to 70° with the arm at his side and 130° of forward elevation. He had 5/5 strength and a negative lag sign. Pain and an audible click were present within the AC joint with cross-body adduction.

Having failed conservative management in conjunction with having continued pain and instability, the discussion about surgical management was had with the patient. He was consented for an arthroscopic-assisted open reconstruction of the AC joint using semitendinosus allograft.

### Author's Preferred Technique

The patient is seen and marked in the preoperative holding area. The patient is brought to the operating room and transferred from the stretcher to the table. After induction of general endotracheal anesthesia, the patient is placed in the beach chair position. The affected upper extremity is prepped and draped in the usual, sterile fashion. After surgical time out, a C-arm is brought in from the ipsilateral side to

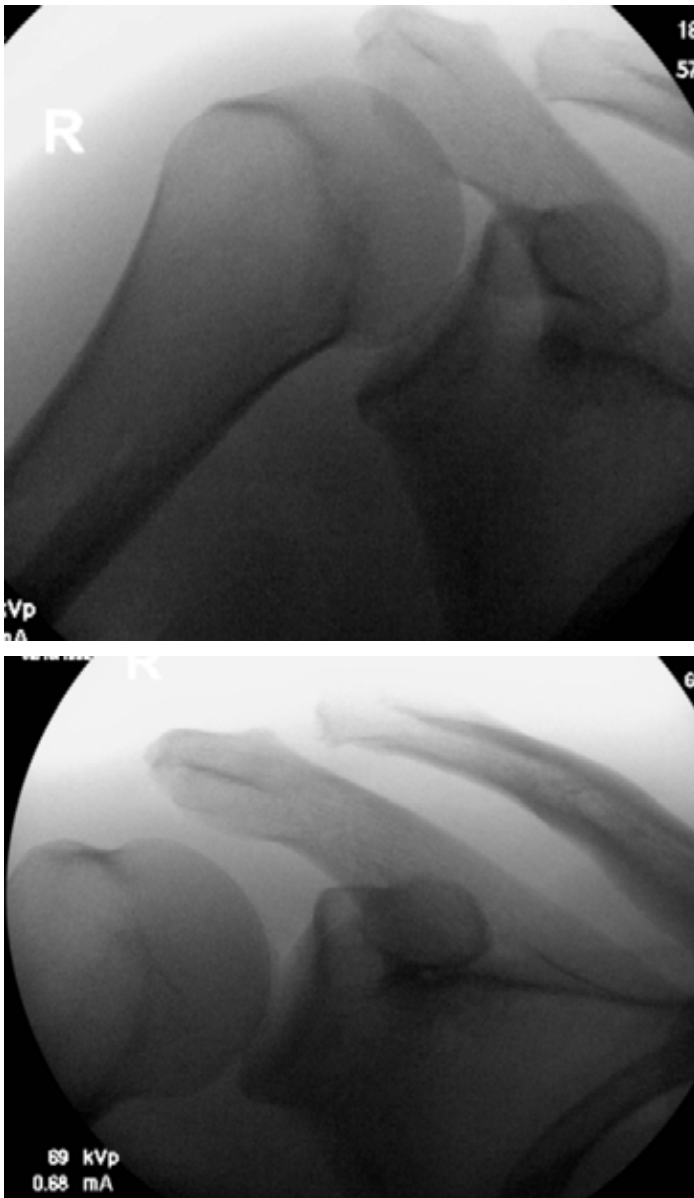
fluoroscopically visualize the AC joint. A reduction maneuver is performed under fluoroscopy to confirm that the AC joint is reducible (Figure 5).

Attention is turned to the shoulder for a diagnostic arthroscopy through a standard posterior portal. A systematic evaluation is performed of the glenohumeral joint surfaces, subscapularis tendon, biceps tendon, labrum, glenohumeral recesses and rotator cuff to identify concomitant intra-articular pathologies. An anterior portal is then created through the rotator interval, through which a shaver can be introduced to prepare the undersurface of the coracoid. A secondary anterior inferior portal is then established through which the arthroscopic shaver can be introduced to allow for complete preparation of the undersurface of the coracoid. Both of these anterior portals are created above the superior border of the subscapularis to avoid injury. The use of the 70° scope helps to obtain a better view of the undersurface of the coracoid which is cleared of any soft tissue before placement of the drill guide.

After sufficient intra-articular preparation of the coracoid, the open approach to the AC joint is performed. Attention is turned to the superior aspect of the AC joint where a 2 to 4 centimeter incision is made over the distal clavicle. The incision is carried down through skin and subcutaneous tissue to the level of the deltotrapezial fascia, which is then incised along its fibers along the midportion of the clavicle. The periosteum is elevated off the bone with a key elevator. A modified ACL guide is then placed over the top of the clavicle



**Figure 4.** AP radiograph of the bilateral AC joints demonstrating just under 100% displacement of the right AC joint compared to the left.

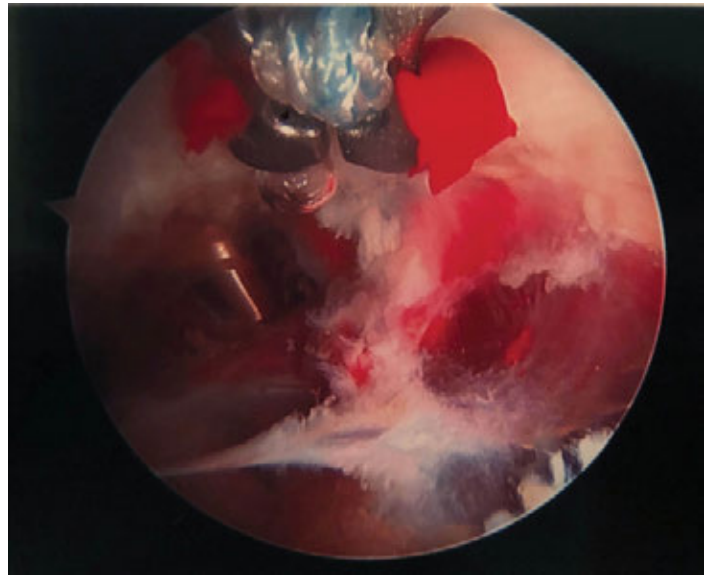


**Figure 5.** Intraoperative fluoroscopy demonstrating reducibility of the AC joint.

and through the anterosuperior portal to the undersurface of the coracoid under direct arthroscopic visualization.

Next, a cannulated 3 mm drill bit is utilized to drill through the four cortices of the distal clavicle and coracoid. A nitinol wire is passed through the cannulated drill bit. Then, 2 Fiber Tapes placed into a suture button are loaded and shuttled from the anteroinferior portal through the drill holes utilizing the nitinol wire. The sutures are tagged and attention is then turned towards preparation of the allograft reconstruction.

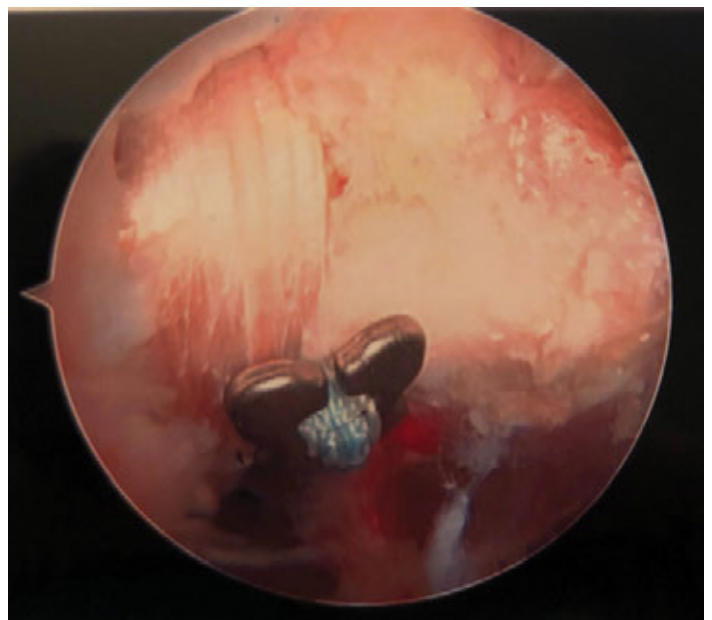
Under direct arthroscopic visualization a switching stick is placed in a position posterior to the clavicle and medial to the coracoid (Figure 6). A dilator is placed over the switching stick to allow for passage of the allograft. A second pathway is created in a similar fashion with use of a switching stick in a position just anterior to the clavicle. These dilated soft tissue pathways are used to best recreate the position of the individual coracoclavicular ligaments without having to drill



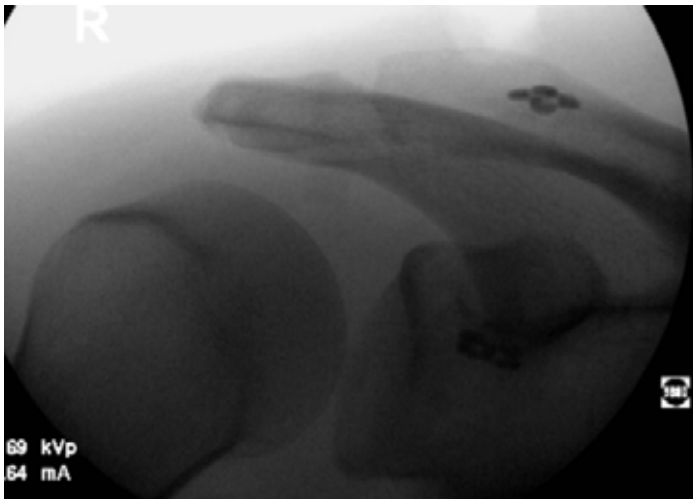
**Figure 6.** Intra-operative arthroscopic image demonstrating the suture button in place under the coracoid. There is a switching stick present posterior to the clavicle to make a passage for the graft posterior to the clavicle and medial to the coracoid.

their positions through the distal clavicle. Shuttle sutures are placed through both portals and brought out through the anterior portal.

On the back table a semitendinosis allograft is prepared. After allowing the graft sufficient time to defrost, FiberLoop sutures are placed through both ends of the graft in a baseball stitch configuration. Then, with use of the shuttling sutures, the graft is shuttled from the posterior aspect of the clavicle around the medial aspect of the coracoid, laterally around the coracoid and through the anterior aspect of the clavicle. The proper position of the graft is then confirmed arthroscopically, with the graft seated over the coracoid button and against the undersurface of the coracoid.



**Figure 7.** Intra-operative arthroscopic image demonstrating the final position of the graft and suture button under the coracoid.



**Figure 8.** Intraoperative fluoroscopy demonstrating maintained reduction of the AC joint and CC distance after reconstruction with semitendinosus allograft. Suture buttons visualized on the superior and inferior aspects of the distal clavicle and coracoid respectively.

Next, a reduction maneuver is performed to return the AC joint to its anatomic position. The humerus is pushed proximally while the clavicle is pushed down. The Fiber Tape sutures are then tied down sequentially over a button over

the superior aspect of the clavicle to reduce the distance of the coracoclavicular joint. The semitendinosus allograft is then tied in a half hitch and sutured in a side-to-side fashion using #2 FiberWire sutures (Figure 7).

C-arm is brought in to fluoroscopically confirm appropriate reduction of the AC joint (Figure 8). The wounds are then irrigated and closed in a standard layered fashion. The wounds are dressed and the arm is placed into a sling.

Post-operatively, the patient is kept non-weight bearing in the sling for the first six weeks after surgery to prevent attenuation of the reconstruction. This is then followed by initiation of formal physical therapy focused on shoulder range of motion and strength.

## References

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