Technical Note

Arthroscopic Coracoclavicular Ligament Stabilization Using Coracoid Cortical Suspension in Acute Acromioclavicular Joint Injury; Precision of Drill Tunnel

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Abstract: Acute acromioclavicular joint separation is a common injury of the shoulder. There are several methods for treating this condition; however, there is no gold standard established. Herein, we propose an arthroscopic method for the treatment of acute acromioclavicular joint separation using a simple cortical suspension device at the coracoid base via a transclavicular–transcoracoidal tunnel and tieing the suture at the clavicle. This method has the advantages of making a precision drilling tunnel using small implants and small stab incisions, with better cosmetic results and less implant irritation.

Acute acromioclavicular (AC) joint separation is a common injury of the shoulder. There are many methods such as AC fixation, coracoclavicular (CC) fixation, and ligament reconstruction for the treatment of this condition. AC fixation with a smooth pin or hook plate fixation has reported good outcome but has the disadvantage of implant irritation.[1] The previous literature also reported good outcome with open and arthroscopically assisted treatment of the AC joint without using an autograft.[2] However, there is no gold standard for treatment. We propose a simple method for treating this condition arthroscopically using 1 EndoButton CL Ultra (Smith & Nephew, London, UK) suspended at the coracoid base while the other one is placed on the clavicle via the transclavicular–transcoracoidal tunnel. This technique provides only small stab wound incisions for better cosmetic outcomes; only 2 small implants were used and hence caused less irritation of the skin.

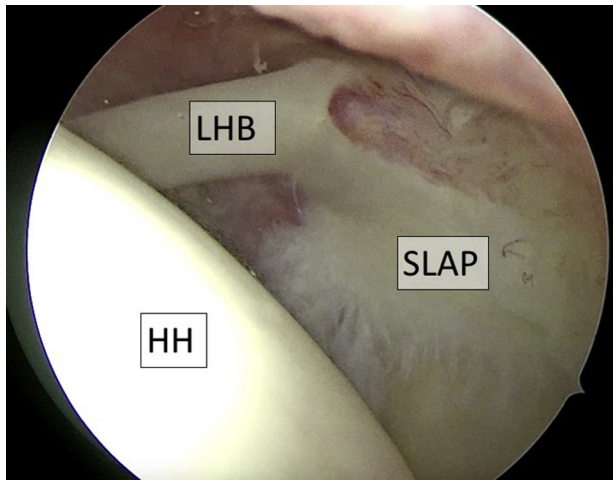

Fig 1. An arthroscopic view from the posterior portal of a left shoulder of the patient who sustained an acute acromioclavicular joint injury. Glenohumeral joint examination should be done looking for associated injury, especially a SLAP lesion, by following the long head biceps tendon (LHB). (HH, humeral head.)

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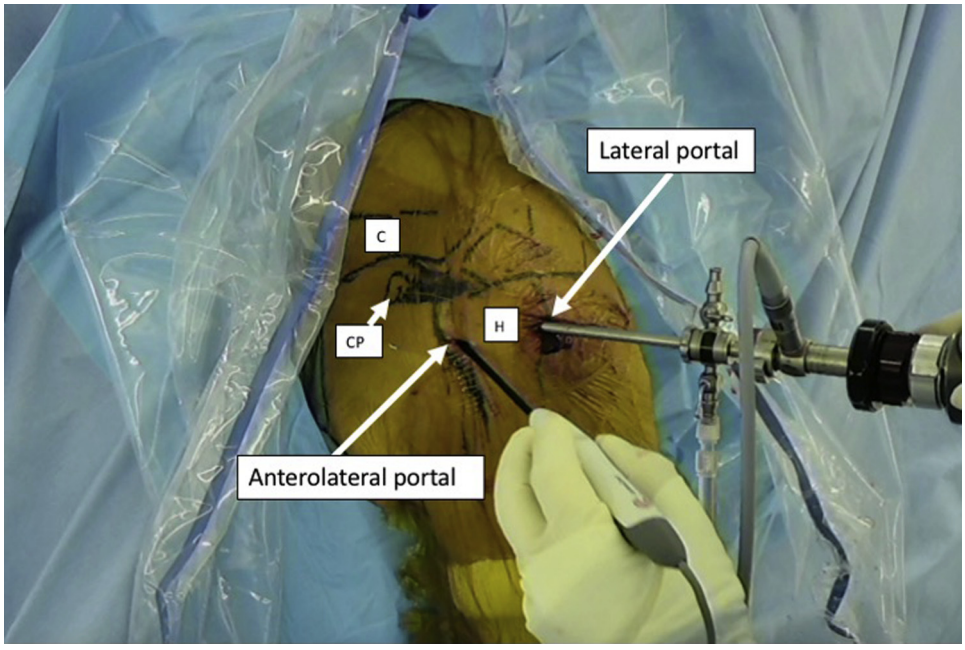

Fig 2. Arthroscopic portals used for subacromial space exploration in acute acromioclavicular joint injury. The lateral portal was used for a viewing portal and the anterolateral portal was used for a working portal. (C, clavicle; CP, coracoid process; H, humerus.)

Surgical Technique

Indications

An acute (within 3 weeks) AC joint injury Rockwood type III or higher grade (IV-VI),[3] which became stable in the horizontal plane.

Positioning

The patient was placed in the beach chair position. The injured arm was draped free.

Surgical Procedure

A standard posterior portal was created, and an intra-articular examination of the glenohumeral joint was undertaken. We identified the long head biceps tendon and its origin from the glenoid labrum; one of the commonly associated injuries of the AC joint was the SLAP lesion (Fig 1).[4]

The subacromial space was entered arthroscopically through a lateral portal. The anterolateral portal was used as the working portal (Fig 2). The coracoacromial ligament was identified at the acromion and used cauterization to follow it to the coracoid. After reaching the coracoid, electro-cauterization was used to prepare the base of coracoid. The viewing portal was then switched to the anterolateral portal and an anterior portal was created as a working portal (Fig 3). A switching stick was then inserted at the lateral portal to retract the soft tissue that obscures visualization (Fig 4).

A stab incision was then made on the clavicle 3 cm medial to the AC joint for drill guide placement. An anterior portal was then created and an anterior cruciate ligament (ACL) tibial drilling guide (Smith & Nephew) was inserted through this portal; the guide was placed at the center close to the base of coracoid (medial) as possible (Fig 5). We emphasized misleading on distortion of view from an arthroscope. We had to imagine a third dimension to correct the precision of the drill hole. From an arthroscopic view, we placed the drill guide more posteriorly. As a result, the tunnel was more at the center of the coracoid (Fig 6). Drilling was

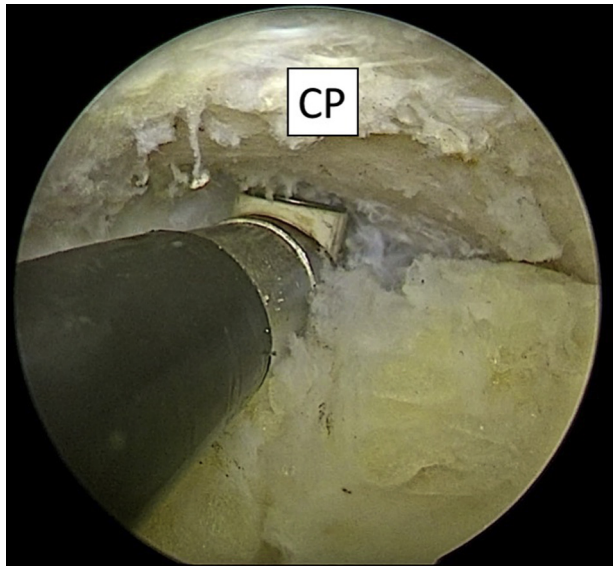

Fig 3. Arthroscopic view from the anterolateral portal of the left shoulder of the patient who sustained the acute acromioclavicular joint injury. Electro-cauterization was used to prepare the base of the coracoid process (CP).

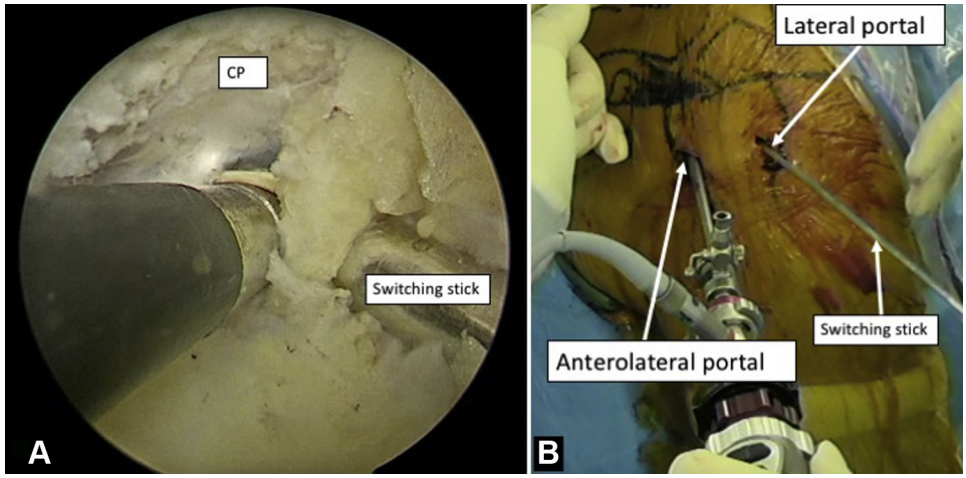

Fig 4. Arthroscopic and outside view of the left shoulder of the patient who sustained an acute acromioclavicular joint injury. (A) Arthroscopic view from anterolateral portal showing a switching stick used for retraction of soft tissue, which obscured the view. (B) A switching stick was inserted from the lateral portal and held by the assistant surgeon. (CP, coracoid process.)

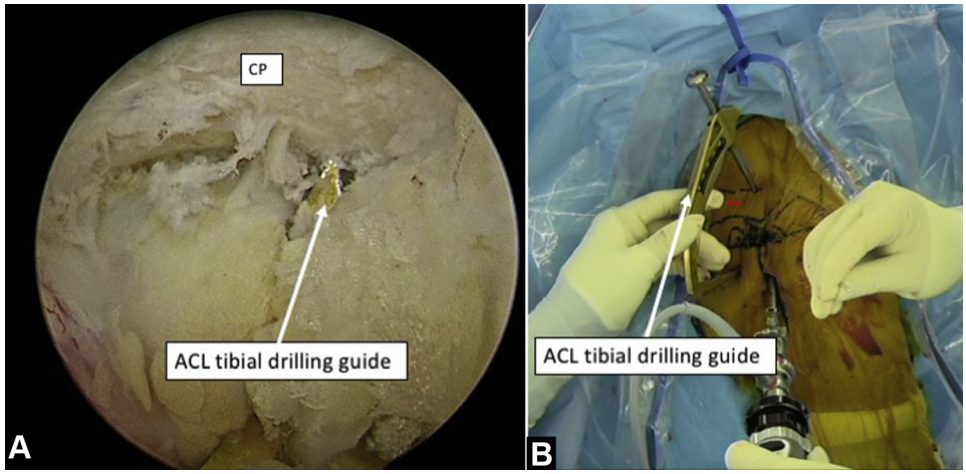

Fig 5. Arthroscopic and outside viewing of the left shoulder of the patient who sustained an acute acromioclavicular joint injury. (A) Arthroscopic view from an anterolateral portal showing an ACL tibial drilling guide (Smith & Nephew) that was placed as close as possible to the base of the coracoid (medial) and at the center. (B) An ACL tibial drilling guide was placed through the anterior portal. The stab incision was made after on the clavicle (red line) about 3 cm medial to the acute acromioclavicular joint. (ACL, anterior cruciate ligament; CP, coracoid process.)

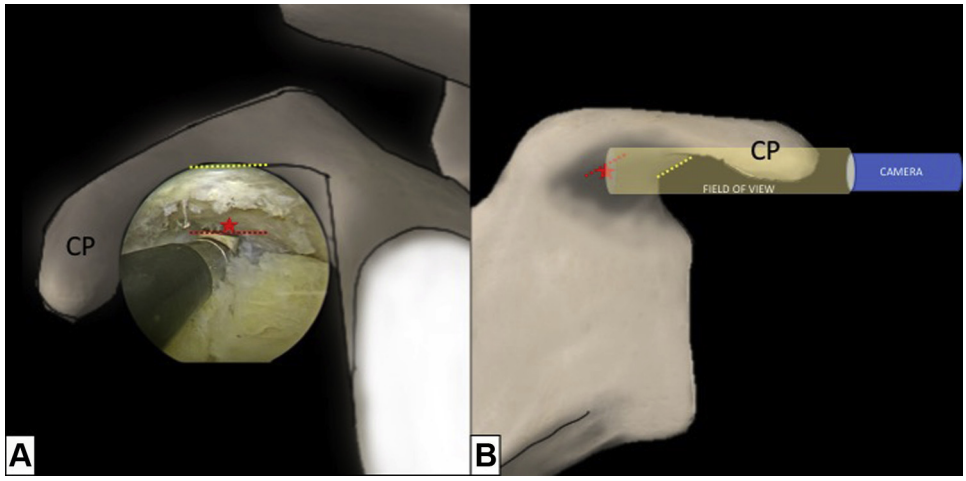

Fig 6. The position of the drill guide to make tunnel through the coracoid process (CP) in an acute acromioclavicular joint injury when viewing from an arthroscope. (A) Sagittal view from an arthroscope showing the anterior part (yellow dot line) and the posterior part (red dot line) of the coracoid base. The placement of the drill guide (red star) should be close to the posterior part. (B) When viewing from a coronal view, the posterior part from an arthroscopic view was not of the true posterior cortex; the position is close to the center of the coracoid base. This was the distortion of view from the arthroscope.

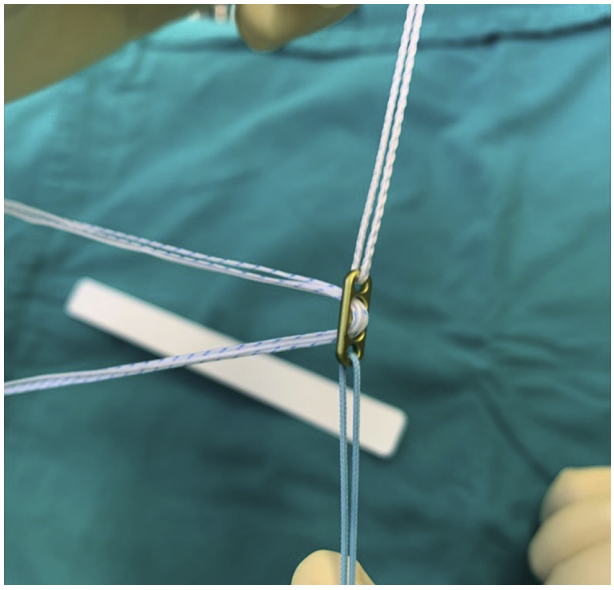

Fig 7. Endobutton acute acromioclavicular Ultra (Smith & Nephew), which removed the continuous loop in the middle and replaced it with 5 to 6 strands of high-strength suture material (Hi-fi; ConMed) through 2 holes each in the middle. This button was used for suspension at the coracoid base for coracoclavicular stabilization.

done from the clavicle and through the coracoid. A 4.5-mm cannulated reamer was used following the drill guide. A wire-passer was inserted through the cannulated reamer and then the wire retrieved via the anterior portal.

We used EndoButton CL Ultra and removed the continuous loop in the middle and replaced it with 5 to 6 strands of high-strength suture material (Hi-fi; ConMed, NY) through 2 holes each in the middle. With the higher number of strands, the strength of suspension will be higher (Fig 7). The EndoButton was then passed from the clavicle through the coracoid via a wire passer. The button was then flipped after passing the coracoid (Fig 8) (Video 1).

The untied end of each strand of the suture material was passed through the middle 2 holes of another removed continuous loop Endobutton. Reduction was performed by applying superior force to the arm, checked with a fluoroscope, and the knot tightened (Fig 9).

Postoperative Protocol

Arm sling immobilization was used during the first 3 weeks after the operation. Passive and pendulum shoulder exercises were started on the first day post-surgery. The patient was advised to avoid lifting heavy objects. A progressive passive range of motion exercise program was started after 3 weeks. At 8 weeks, free active range of motion should be achieved. Ten to 12 weeks into the postoperative period, shoulder strengthening exercises were started. Full sport activities were resumed after 6 months.

Advantages/disadvantages, pearls/pitfalls, and indications of the procedure are further described in Table 1.

Discussion

CC stabilization using cortical suspension was proved beneficial in an acute AC joint dislocation in both a biomechanical and a clinical study.[5,6] In high-grade AC joint injuries, some authors recommend both AC and CC joint stabilization.[7,8] However, in acute injury, the potential for healing the AC and CC ligaments is high; thus, if the fixation is strong enough, graft reconstruction is not required. Our technique is beneficial in Rockwood type III injury or high-grade injury, which is stable in the horizontal direction. If instability in the horizontal plane occurs after fixation, percutaneous cerclage of the AC joint is recommended.[8]

Although the transclavicular–transcoracoidal tunnel procedure is common, accurate placement is important because of the risk of coracoid fracture or cortical breach, which may lead to repair failure. The recent anatomic considerations of transclavicular–transcoracoid drilling for coracoclavicular ligament showed a higher peak load to failure with a medial and center placement of drill,

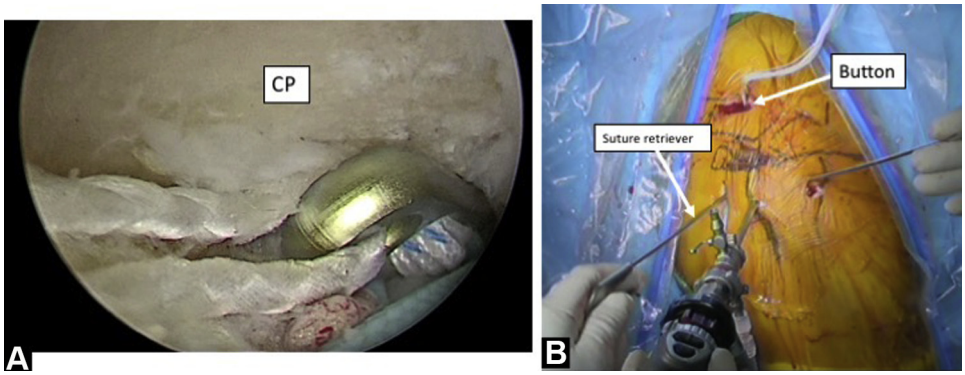

Fig 8. Arthroscopic and outside views of the left shoulder of the patient who sustained an AC joint injury. (A) Arthroscopic view from the anterolateral portal revealed the EndoButton CL Ultra (Smith & Nephew) flipped under the coracoid process (CP). (B) The button was passed from the clavicle through the CP; the suture retriever was used to retrieve the suture from the anterior portal.

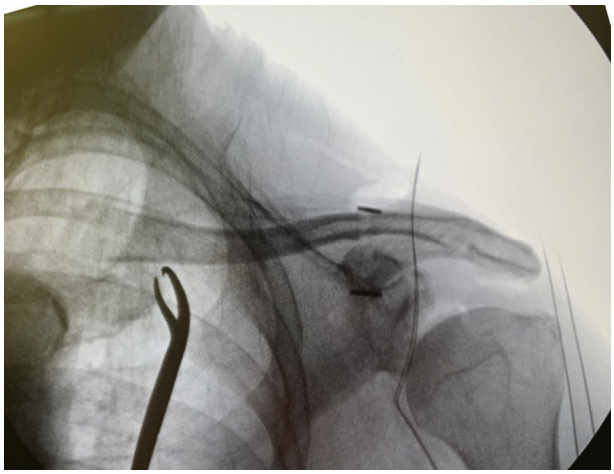

Fig 9. Fluoroscopic left shoulder anteroposterior view of a patient who sustained a left acute acromioclavicular joint injury. Reduction was done by applying superior force to the arm. Check the reduction with a fluoroscope before tightening the knot on another EndoButton. Slight overreduction is recommended.

which is comparable to our technique.[9] Another cadaveric study by Coale reported the risk of cortical breach if remaining cortex is less than 7 mm.[10] From our study of anthropometry of coracoid process, we found that safe area for drill tunnel is less than 7 mm in males and 6 mm in females.[11] So, placement of the drill is an important step for transclavicular–transcoracoidal tunnel.

There is no gold standard for the treatment of acute AC joint injury. We believe that, in acute injury, if we can provide enough CC stabilization, AC joint stabilization is not required for low-grade or high-grade injury. In doubtful cases, AC stabilization with cerclage or smooth pins may be added. This technique is recommended for acute AC joint injury for better cosmetic results and less skin irritation.

Table 1. Advantages/Disadvantages, Pearls/Pitfalls, and Indications of the Procedure

Advantages
- No need for Special Equipment
- Minimal Invasive Procedure
- Better Cosmetic Appearance because of Small Stab Wounds
- Address Associated Injuries Such as SLAP Lesion
- Less Implant Irritation
Disadvantages
- Need arthroscopic skill
- Does not address acute acromioclavicular joint pathology
Pearls
- Tibial anterior cruciate ligament guide drill should be placed as close as possible to the base and the center of coracoid process
- Drill should be placed at the center of clavicle to avoid fracture of the clavicle
- Reduction should be done with fluoroscopic guidance and over-reduction is recommended
- Switching stick should be used to retract soft tissue for better visualization
- Placement of curette under drill and ream while passing the coracoid is recommended to avoid neurovascular injury
Pitfalls
- Peripheral placement of drill guide
- Less reduction while tightening the knot
- Obscure visualization and error in drilling and reaming
Indications
- Acute (within 3 weeks) acute acromioclavicular joint injury Rockwood type III or higher grade (IV-VI), which is stable in the horizontal plane

References

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