

Acromioclavicular Joint Repair Using a Suture Cerclage Tensioning System



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Abstract: Injuries to the acromioclavicular (AC) joint are common among adults in their twenties and account for 8% of all joint dislocations. Although there are numerous operative approaches to treating AC joint separations, a gold standard does not exist because of lack of conclusive evidence supporting the use of 1 standard technique. In this Technical Note and accompanying video, we describe an anatomic AC joint repair using a suture cerclage tensioning system to accurately control the reduction and improve the precision and outcomes of the repair.

The acromioclavicular (AC) joint is a diarthrodial joint that serves as the point of articulation between the scapula and clavicle.^{1,2} Injuries to the AC joint are often caused by either a direct blow to the joint or trauma that occurs when the arms are in an adducted position.¹⁻³ In 1998, Rockwood et al.⁴ released a classification system that is now the most frequently used measure to assess AC joint injuries. Type I and II injuries are frequently treated non-operatively with shoulder immobilization, ice, and rest. Type IV, V, and VI injuries require operative treatment to avoid morbidity and to restore AC joint and thus shoulder function. However, the management of type III injuries is a source of controversy, with the course of treatment often decided on a case-by-case basis.^{1,2}

Another source of confusion is which technique the surgeon should use to repair the damaged AC joint.⁵ This is because of the numerous repairs available and

the lack of literature to conclusively support 1 specific technique.⁵ Although some of the most common techniques used today include the hook-plate technique and arthroscopic fixation, neither these nor other techniques offer a method to accurately control the amount of reduction.⁵ The purpose of this Technical Note and [Video 1](#) is to describe the use of a suture cerclage tensioning system to provide an anatomic reduction of a type V AC joint separation while accurately controlling the reduction to improve the precision and outcomes of an AC joint repair.

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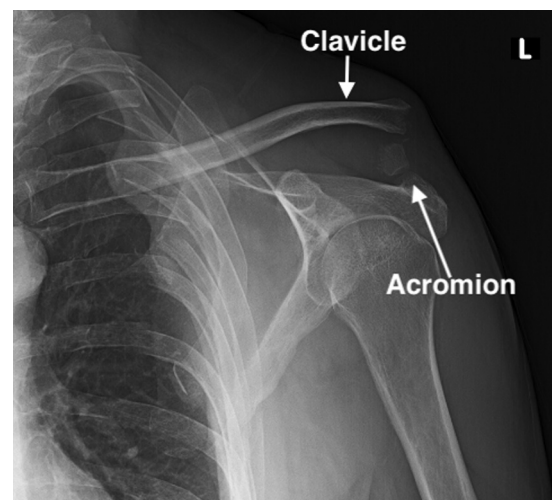


Fig 1. Preoperative radiograph (anteroposterior view) of the left (L) shoulder confirming a type V acromioclavicular joint separation.

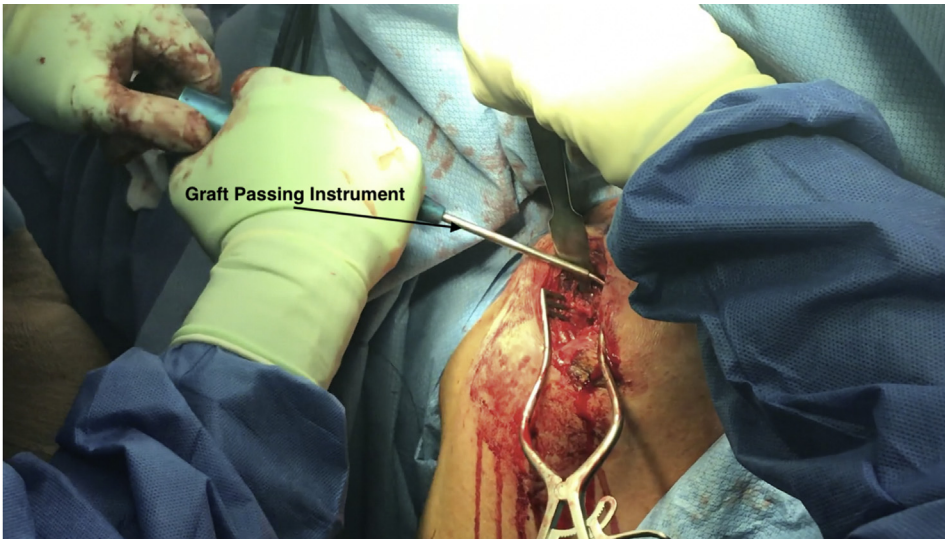


Fig 2. Intraoperative image of Arthrex curved acromioclavicular joint graft passing instrument used to pass a nitinol wire under the left coracoid. This nitinol wire loop is used to shuttle a No. 2 FiberWire suture.

Surgical Technique

Preoperative Assessment

The preoperative assessment consists of a physical examination and radiograph (anteroposterior) to identify the degree of separation (**Fig 1**). Magnetic resonance imaging or computed tomography may be used for further diagnostic testing.

Patient Positioning

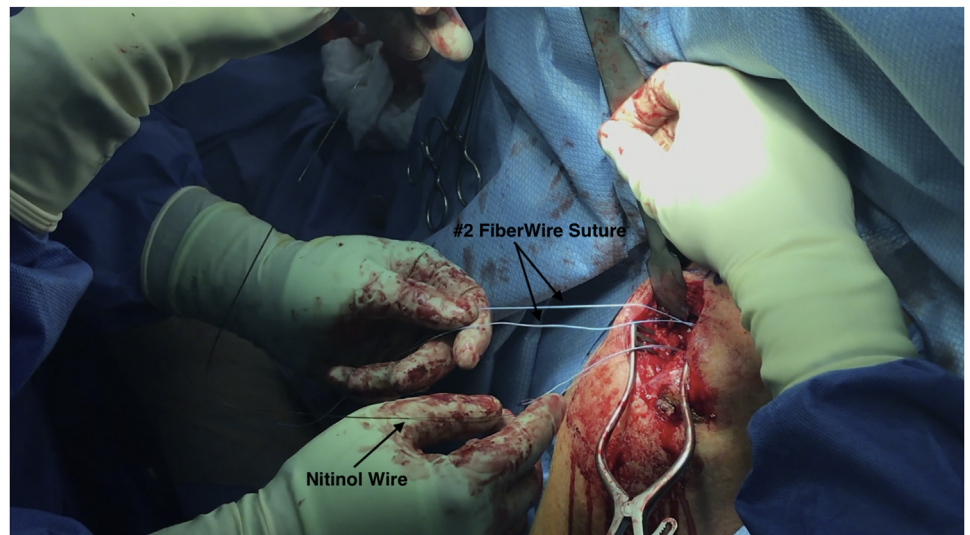
The patient is positioned in the beach-chair position with a well-padded head and face cushion and is anesthetized using general anesthesia. All bony

prominences are well padded. The operative shoulder is treated with preoperative skin preparation solution and draped in the usual sterile fashion.

Surgical Approach to AC Joint and Coracoid Process

A linear incision is made extending over the AC joint. Metzenbaum scissors and pickups are used to dissect down from the deltopectoral fascia to the superior border of the clavicle. A Cobb elevator and electrocautery are used to gently reflect the trapezius attachments and periosteum from the distal clavicle and acromion to fully visualize the AC joint separation.

Fig 3. Intraoperative image of the No. 2 FiberWire suture passed under the left coracoid. A nitinol wire is used to help shuttle the No. 2 FiberWire suture.



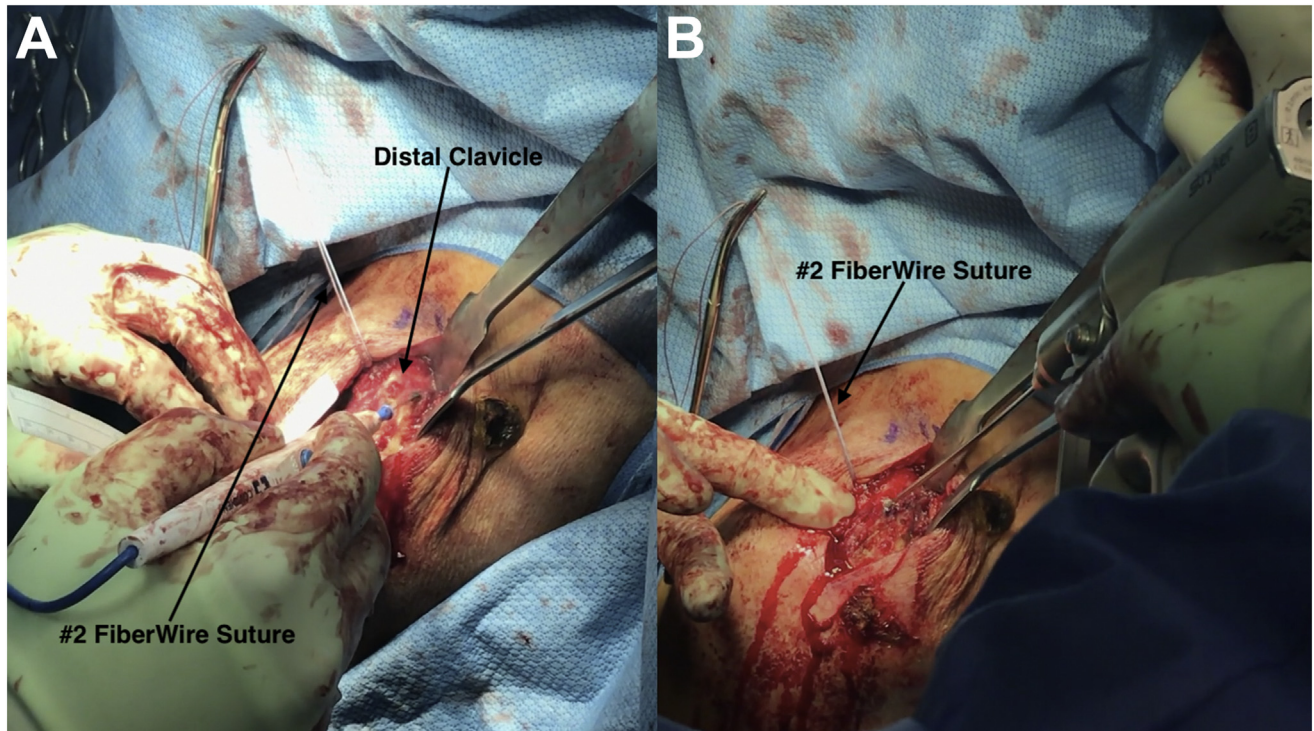


Fig 4. Intraoperative images of the creation of the left conoid and trapezoid bone tunnels. (A) Electrocautery is used to mark the anatomic attachment points of the conoid and trapezoid coracoclavicular ligaments on the superior border of the left clavicle. (B) A drill is used to create bone tunnels on the superior border of the left clavicle at the anatomic attachment points of the conoid and trapezoid coracoclavicular ligaments.

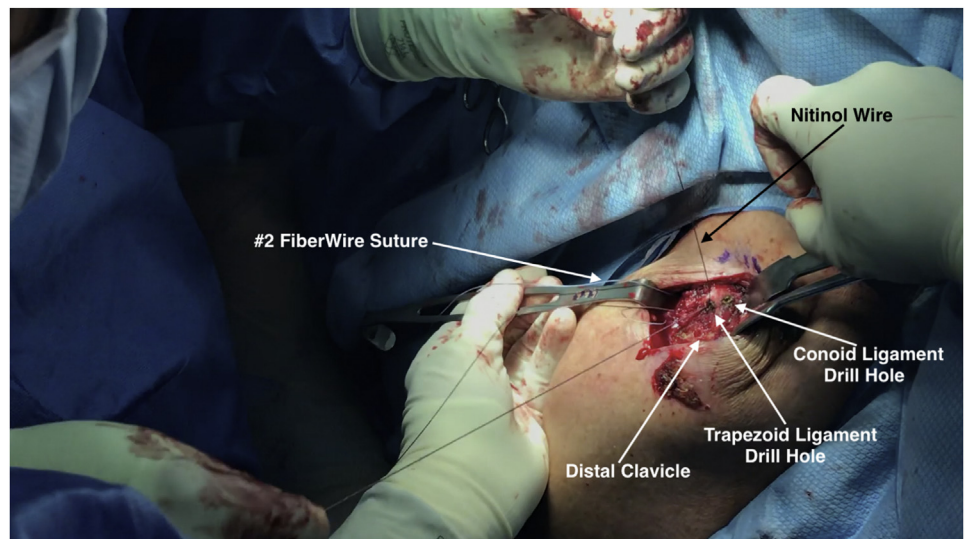
Metzenbaum scissors and blunt finger dissection are used until the superior aspect of the coracoid is palpable.

Suture Passing Under Coracoid and Preparation for Reduction

A nitinol wire loop from a Micro SutureLasso (Arthrex, Naples, FL) is loaded onto a curved AC joint

graft passing instrument (Arthrex), passed under the coracoid, and retrieved with a clamp (Fig 2). The nitinol wire is used to pass a No. 2 FiberWire suture (Arthrex) under the coracoid (Fig 3). Electrocautery and a ruler are used to mark the native attachment points of the conoid and trapezoid coracoclavicular ligaments, and both are drilled in a bicortical manner on the superior border of the clavicle (Fig 4). A nitinol wire loop is then

Fig 5. Intraoperative photograph of the nitinol wire used to pass the No. 2 FiberWire suture through the trapezoid drill hole on the superior border of the left clavicle. This process is repeated for the conoid drill hole.



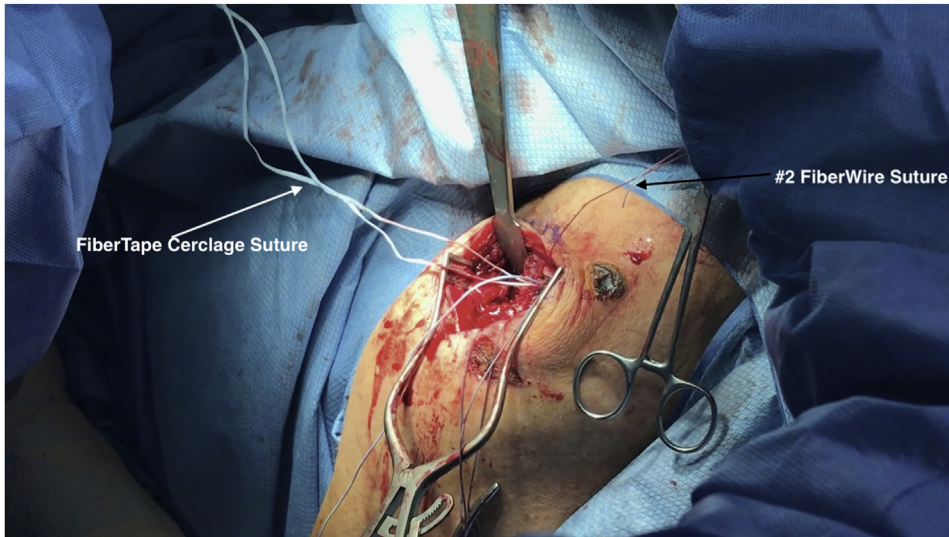


Fig 6. Intraoperative image of the FiberTape cerclage suture passed through the conoid and trapezoid drill holes of the left clavicle. A No. 2 FiberWire suture is used to help shuttle the FiberTape suture. The FiberTape suture is placed through the conoid ligament drill hole, under the coracoid, and out of the trapezoid ligament drill hole.

used to pass 1 end of the No. 2 FiberWire suture through the conoid drill hole (Fig 5), and this process is repeated with the other end of the No. 2 FiberWire suture through the trapezoid drill hole. This suture is used to pass both the FiberTape sutures from the FiberTape cerclage system (Arthrex) and an additional No. 5 FiberWire suture through the conoid drill hole, under the coracoid, and out of the trapezoid drill hole (Fig 6). The No. 5 FiberWire suture is then removed from the

clavicle drill holes and clamped to the side so that it is only passed under the coracoid.

AC Joint Reduction

The suture tail of the FiberTape cerclage suture (Arthrex) is loaded onto the FiberLink suture (Arthrex) on the FiberTape cerclage system card (Arthrex) to secure a pre-tied, self-locking racking hitch knot (Fig 7). The card is then removed, and the racking hitch knot is

Fig 7. Intraoperative image of the tail of the FiberTape cerclage suture loaded onto the FiberLink suture on the FiberTape cerclage system card.

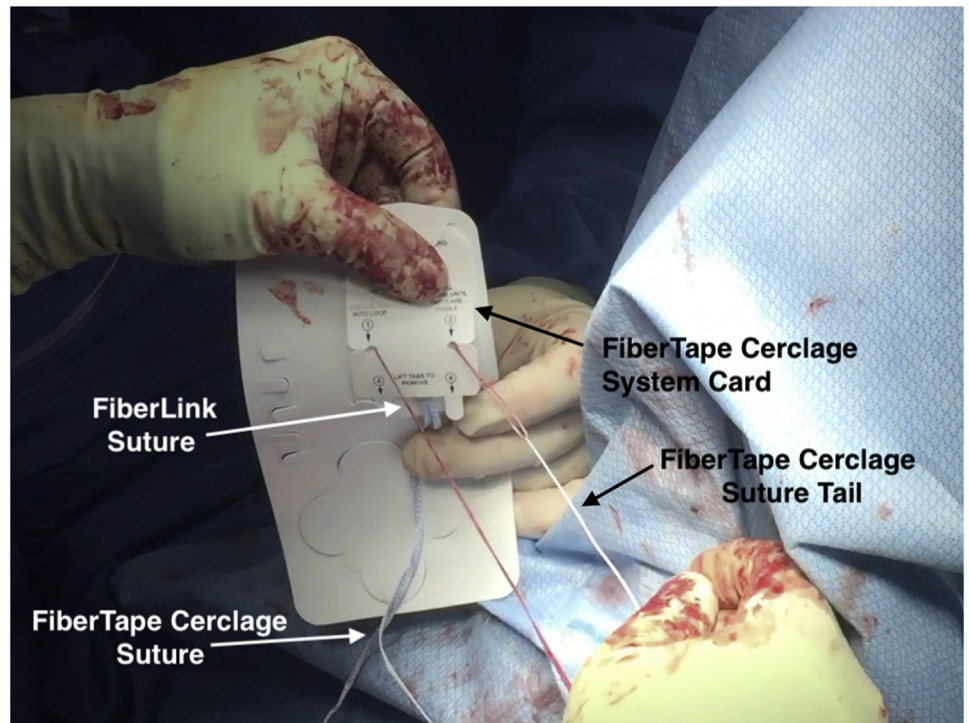
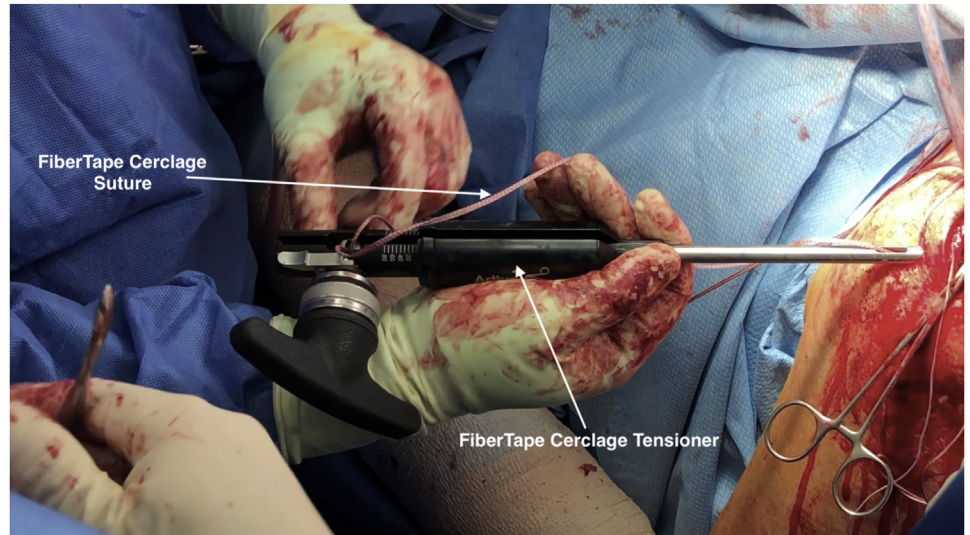


Fig 8. Intraoperative image of the FiberTape cerclage suture loaded into the FiberTape cerclage tensioner for use in the acromioclavicular joint repair in a left shoulder. Both ends of the cerclage suture should be trimmed to the same length and then placed into the roller adjacent to the FiberTape cerclage tensioner handle.



tensioned down to lie flush with the superior clavicular cortex. A right-angle clamp is used to retrieve 1 tail of the No. 5 FiberWire to pass it under the coracoid, leaving 1 tail on either side of the clavicle. The FiberTape cerclage suture tails are trimmed to create 2 even ends that are both loaded through the slot of the roller adjacent to the handle of the FiberTape cerclage tensioner (Arthrex) (Fig 8). The ratcheting handle is then turned until desired reduction tension is achieved (Fig 9). The tails of the No. 5 FiberWire suture are also tied down by hand to further reinforce the pre-tied, self-locking racking hitch knot. These key steps are shown in Video 1.

Final Examination and Postoperative Care

Fluoroscopic imaging of the AC joint is obtained to confirm proper reduction (Fig 10). The patient is fitted

in a sling that should be worn at all times for the first 6 weeks after the procedure. Formal physical therapy should begin at the 6-week mark to regain range of motion and strength. Contact sports should be avoided until 18 weeks after the procedure. At this point, the patient may return to full activity as tolerated. Pearls and pitfalls of this procedure are summarized in Table 1, and advantages and disadvantages are presented in Table 2.

Discussion

Although clear treatment options are delineated for type I, II, IV, V, and VI AC joint injuries, there is no consensus on type III injuries. In addition, there is a dearth of Level I evidence analyzing nonoperative versus operative treatment methods for type III injuries, with a recent review by Stucken and Cohen³ noting



Fig 9. Intraoperative image of the surgeon tensioning the FiberTape cerclage tensioner to reduce the left clavicle and complete the left acromioclavicular joint repair.

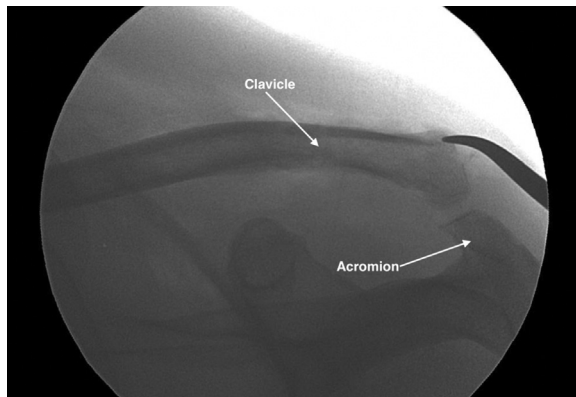


Fig 10. Final intraoperative fluoroscopic image of the left acromioclavicular joint repair using a suture cerclage tensioning system.

that retrospective case series offer the best evidence currently available.⁵ However, various studies agree that type III injuries should be treated on a case-by-case basis, taking into account the patient's occupation, hand dominance, and level of activity.^{1,2,6}

Today, of the numerous options available, the Endo-Button (Smith & Nephew Endoscopy, Andover, MA) coracoclavicular fixation technique is one of the most popular techniques orthopaedic surgeons have at their disposal for surgical intervention of AC joint injuries.⁷ In a study analyzing patient outcomes using this technique over the course of 58 months, Venjakob et al.⁸ found that of the 23 patients, 8 showed radiographic failures from either undercorrection or posterior displacement or both. At the same time, an additional 4 patients had overcorrection of the coracoclavicular distance. Unfortunately, to our knowledge, neither the popular EndoButton technique nor any of the other current techniques documented in the literature allow for the amount of reduction to be accurately controlled.

The proposed technique hopes to circumvent this key problem by using a FiberTape cerclage system to control the amount of reduction and avoid undercorrection or overcorrection of the AC joint; this is made possible through the precise use of the cerclage tensioner and by

Table 1. Pearls and Pitfalls of Acromioclavicular Joint Repair Using Suture Cerclage Tensioning System

Pearls

- Place the fingers over the bull's-eye on the FiberTape cerclage suture card.
- Clamp the sutures to the side to maintain good suture organization.
- Apply downward pressure on the clavicle while tying knots to maintain reduction.

Pitfalls

- Take care to avoid over-reducing the joint.
- Avoid prematurely removing the FiberTape from its card.
- When drilling through the clavicle, avoid the neurovascular structures to prevent iatrogenic injury.

Table 2. Advantages and Disadvantages of Acromioclavicular Joint Repair Using Suture Cerclage Tensioning System

Advantages

- Allows surgeon to accurately control amount of reduction
- Nonmetal implant eliminates need for surgical hardware removal
- Anatomic repair of coracoclavicular ligaments

Disadvantages

- Technically challenging
- Possibility of posterior instability
- Risk of iatrogenic damage to musculocutaneous nerve

confirmation of the reduction with fluoroscopy. In doing so, we hope that our technique can minimize the need for revision surgery and lead to better patient outcomes. Another advantage of our technique is that in using a nonmetal implant, the need for another surgical procedure to remove any hardware is eliminated. Finally, the additional sutures can be passed through the drill holes and under the coracoid to increase the stability of the reduction.

One possible disadvantage of our technique is the increased technical difficulty of the procedure. At the same time, if the surgeon is not familiar with the equipment, the instruments may be difficult to manage. Another disadvantage of our technique is that as the AC ligament itself has not been repaired, the possibility of posterior instability exists. Further research is necessary to analyze whether the proposed technique leads to better clinical outcomes.

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