Open Acromioclavicular Joint Reconstruction via Cerclage With Semitendinosus Allograft

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Background: Acromioclavicular (AC) joint separations occur most often in young male patients, commonly in athletes. Initially described by Jones et al. in 2001, reconstruction with semitendinosus allograft via cerclage has been increasingly adopted in recent times, though this not been as well described in video journals.

Indications: Operative management of AC joint separation is classically indicated in Rockwood grade IV or higher AC joint injuries and controversial for grade III separations. One such treatment is AC joint reconstruction with semitendinosus allograft as described in this 37-year-old male patient, with a grade IIIB AC joint separation.

Technique Description: A 6-cm incision was created overlying the clavicle. No distal clavicle excision was performed, but coracoclavicular (CC) scar tissue was elevated with medial and lateral windows about the coracoid. A passing suture was placed around the coracoid, and holes were drilled in the clavicle at 17% and 31% of the total clavicle length, consistent with ratios described by Rios et al; 5-mm tunnels were created corresponding to the trapezial and conoid limbs of the CC ligaments and tapped to 5.5 mm. A semitendinosus allograft was passed and fixed with two 5.5 × 15 mm polyetheretherketone (PEEK) screws after primary fixation with a FiberTape cerclage looped around the coracoid and clavicle independently with use of a tensiometer for maximal tightening. A FiberTak was used to fix the additional graft limb at the acromion to stabilize the AC joint and reinforced on itself with 0 vicryl. The patient was placed in a sling and assigned physical therapy (PT) focusing on limiting shoulder abduction and forward flexion for the first 6 weeks.

Results: At 6 months postoperation, the patient continues to progress from PT, with low pain and near full range of motion. Although PT protocols vary widely, a full recovery is expected by 6 months, with the patient able to return to work, lifting no greater than 50 pounds.

Discussion/Conclusion: This study describes the treatment of an acute grade IV AC joint separation in a 37-year-old male patient. Further adoption of AC joint reconstruction utilizing a semitendinosus allograft via cerclage continues to be a viable option for patients requiring operative management.

Patient Consent Disclosure Statement: The author(s) attests that consent has been obtained from any patient(s) appearing in this publication. If the individual may be identifiable, the author(s) has included a statement of release or other written form of approval from the patient(s) with this submission for publication.

Keywords: acromioclavicular reconstruction; reconstruction via cerclage; AC joint injury

VIDEO TRANSCRIPT

This video demonstrates our technique for an open acromioclavicular (AC) joint reconstruction via cerclage with semitendinosus allograft.

Here are our disclosures.

BACKGROUND

The AC joint is a diarthrodial joint between the distal clavicle and medial portion of the acromion process of the scapula. It is supported by the AC ligaments which prevent posterior translation and axial rotation, and the conoid and trapezoid ligaments, together forming the coracoclavicular (CC) ligament which prevents anterior and superior translation.[2,6] Injuries to the AC joint and its surrounding ligaments account for 40% to 50% of all athletic shoulder injuries.[2]

Most surgeons utilize the Rockwood classification depicted here to classify AC joint injuries. This uses integrity of the AC and CC joints, as well as radiographic findings and

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physical examination findings to help guide management. Types III, IV, V, and VI are differentiated from each other based on the degree of CC space widening and joint reducibility.[6,16] Determining correct Rockwood type is important for determining the best course of treatment.[17]

INDICATIONS

Initial treatment of Rockwood types I, II, and III involves nonsurgical management, such as pain management and physical therapy (PT). For higher grade injuries, operative management is considered from over 100 described techniques.[4,6,7,10,12] Due to the chronicity of our patient's injuries, as well as the need for both stability and biology to adequately treat it, reconstruction with semitendinosus allograft and cerclage was chosen for treatment.[1]

Here is a case presentation.

Our patient is a 37-year-old male who presented to the emergency department following a motorcycle crash at 30 miles per hour. In the emergency department, examination and imaging workup showed evidence of left AC joint widening, suggestive of a type III AC joint injury. Full workup was clear for any other injuries, and the patient was discharged in a sling for outpatient orthopedic follow-up.

Examination 2 months after injury showed full range of motion with pain at the anterior left shoulder on passive motion. He had tenderness along the left clavicle and AC joint and there was notable superior protrusion of the clavicle on the left compared with the right.

Plain radiographs of the left shoulder performed at 2 months after injury were notable for superior migration of the clavicle and overlap of the clavicle and acromion on the axillary view. These imaging findings along with magnetic resonance imaging, instability on physical examination, and failed conservative management were diagnostic of a type IIIB AC joint injury. The patient chose to proceed with open left AC joint reconstruction and shoulder arthroscopy.

Depicted here is a visualization of the anatomy of the injury, with disruption of the AC and CC joint ligaments, and superior migration of the clavicle.

Patient goals help us determine certain key steps of our reconstruction. For the patient described in this case, who is not a collision athlete, we elected to utilize clavicle tunnels and polyetheretherketone (PEEK) screws for graft fixation supplemented by a FiberTape cerclage and tenodesis at the acromion as depicted here.

For collision athletes participating in high-energy activities, instead of using tunnels, which increase the risk of clavicle injury, we use an alternative technique whereby the graft is wrapped around the clavicle and then secured with the cerclage, as depicted here.

TECHNIQUE DESCRIPTION

For this case, the patient was placed in the lazy beach chair position, mobilized to a seated position with 30° of head elevation, and prepped and draped in a sterile fashion. Standard anterior and posterior portals were marked for diagnostic arthroscopy along with the incision site and pertinent anatomy.

Initial diagnostic arthroscopy was performed. This showed evidence of diffuse synovitis and a type I superior labrum anterior to posterior (SLAP) tear. The rotator interval was diffusely excavated with careful exposure on the undersurface of the coracoid to facilitate graft passage. No rotator cuff tear or unstable labral injury was encountered.

Reconstruction was subsequently begun. A 6-cm incision was made overlying the clavicle. Surgeons dissected through the deltotrapezial fascia and elevated generous soft tissue flaps for later imbrication. The distal clavicle was skeletonized.

No distal clavicle excision was performed, but CC scar tissue was elevated, and medial and lateral windows were formed along the coracoid.

A passing suture was shuttled around the coracoid.

Two holes were drilled in the clavicle at 17% and 31% of the total clavicle length and midline in the anteroposterior, denoted by arrows in the upper portion of the image. This is in keeping with the ratios described by Rios and colleagues[15] corresponding to the location of the footprints of the conoid and trapezoid ligaments.

Five-millimeter tunnels were created and tapped to 5.5 mm.

Two passing sutures were shuttled around the coracoid, 1 for the FiberTape cerclage and 1 for the semitendinosus allograft. The FiberTape cerclage was first shuttled around the coracoid, and then, this was retrieved on the anterior and posterior aspects of the clavicle for synthetic augmentation and maintenance of reduction. When passing the sutures, it is important to stay close to the bone and work from medial to lateral to avoid surrounding neurovascular structures.

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Next, the semitendinosus allograft was passed through the medial clavicular tunnel. It was then shuttled around the coracoid, using care not to damage surrounding structures. Finally, it was brought up through the laterally based trapezoid CC tunnel.

At this point, the FiberTape cerclage was preliminarily tightened manually on the posterosuperior aspect of the clavicle to prevent suture prominence and was then tensioned and re-tensioned until clavicle reduction was obtained.

The following video depicts the use of a newer tensioner on a different patient case. This new device makes the second re-tensioning step easier through cinching the sutures to the paddle as opposed to loading them directly into previous models. Following clavicle reduction, the tensioner is released, a half hitch tied, and reloaded for final re-tensioning.

Returning to our original case, the allograft was then fixed with two 5.5 × 15 mm PEEK screws. Reduction was maintained with digital pressure and synthetic cerclage augmentation. The graft was held under tension to avoid abrasion or inadvertent truncation of the graft.

A knotless FiberTak was used to fix the additional graft limb at the acromion to stabilize the AC joint, employing the FiberTak as a low-profile suture staple.

The remaining limb was then reinforced on itself with 0 vicryl.

C-arm imaging was obtained to confirm reduction, irrigation was utilized, a pants-over-vest imbrication was performed of the fascial tissue, and portal sites were closed. The patient was then placed in a sling, subsequently extubated, and taken to the postoperative recovery unit in a stable condition.

Here is a depiction of the final construct. As you can see, the allograft loops around the coracoid, is secured to the clavicle, and is supported by the FiberTape cerclage, acting as the CC ligament. It is then secured to the acromion as the reconstructed AC ligament.

RESULTS

Radiographs obtained following surgery showed good alignment of the CC interval and tunnel locations in accordance with the ratios described by Eisenstein and colleagues,[5] which demonstrated the importance of anatomic tunnel placement in mitigating risk of postoperative failure.

In terms of pearls to keep in mind, obtain final reduction and secure fixation prior to attempting allograft placement, keep the sutures organized and maintain proper orientation of the suture card, and ensure that graft and tunnel widths are approximately the same to ensure easy passing of the graft.[8,20] As for potential pitfalls, be aware of surrounding neurovascular structures while drilling and avoid forcing allograft through an underdrilled tunnel to prevent damaging it.[8,20]

Patients typically remain immobilized in a sling for the first 4 weeks following surgery. PT for the first 6 weeks is focused on strengthening and range of motion while maintaining limited forward flexion and shoulder abduction with the goal of eventual progression to full range of motion by 12 weeks postoperatively, and return to contact sports at 4 to 6 months.[3,9]

DISCUSSION

A 2009 cohort study by Tauber and colleagues[18] compared outcomes of a CC reconstruction with those of the modified Weaver-Dunn procedure. Patients had greater joint stability and postoperative outcomes following reconstruction compared with those who underwent the Weaver-Dunn procedure.[18] Millet and colleagues[13] found an overall complication rate of 39.8% for AC joint reconstruction, and this rate has been shown to change with different approaches.[11,14] Reconstruction via cerclage attempts to obviate some of those complications. Wellington and colleagues[19] described that reconstruction via cerclage shows a greater time-zero graft strength and stiffness that is maintained in cyclic motion. This technique is preferred for contact athletes in order to avoid stress risers in the clavicle and decrease the risk of secondary clavicle fracture. Further adoption of AC joint reconstruction using a semitendinosus allograft via cerclage continues to be a viable option for patients requiring operative management.

Thank you for your time.

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