Evaluation of Arthroscopic Stabilization of Acute Acromioclavicular Joint Dislocation Using the TightRope System
SAMEH A. EL SALLAKH, MD

abstract

The purpose of this study was to evaluate the results of the arthroscopic treatment of acute acromioclavicular dislocation using the TightRope system (Arthrex, Naples, Florida). Between January 2006 and May 2007, ten shoulders in 10 patients with acute acromioclavicular joint dislocation (Rockwood types IV and V) underwent arthroscopic acromioclavicular joint stabilization using the TightRope. Average patient age was 30 years (range, 22–42 years), and mean follow-up was 24 months (range, 18–30 months). Follow-up occurred at 2 and 6 weeks, 3 months, and then every 6 months postoperatively. The shoulders were evaluated radiologically by comparing the acromioclavicular joint with the normal side and clinically by assessing the pain, function, and range of joint motion using the Constant score.

Ten patients returned to work without pain 10 to 12 weeks postoperatively. Average Constant score was 96.3 (range, 94–99) at last follow-up. Because of technical error, 1 patient experienced TightRope fixation failure on the coracoid side, and the acromioclavicular joint was redislocated, which was treated by an open technique. The 10 patients were satisfied with their functional results and cosmetic appearance.

The arthroscopic treatment of acute acromioclavicular dislocation using the TightRope is a minimally invasive surgical technique that has been proven effective for the treatment of these lesions. It is characterized by less morbidity, less hospitalization, excellent cosmeses, and early rehabilitation.

Dr El sallakh is from Tanta University Hospital, Tanta, Egypt. Dr El sallakh has no relevant financial relationships to disclose. Correspondence should be addressed to: Sameh A. El sallakh, MD, Tanta University Hospital, Elgaesh St, Tanta, Egypt (saelsallakh@hotmail.com). doi: 10.3928/01477447-20111122-13
Acromioclavicular dislocation is one of the most common shoulder injuries seen in general orthopedic practices. The most common mechanism of injury is a fall with direct force to the lateral shoulder with the arm in abduction. Depending on the magnitude of trauma, this injury can be classified into 6 types. Typically, Rockwood types I and II are treated conservatively, with most patients returning to preinjury levels of activity. Although the treatment of type III injuries is controversial, acute surgical intervention is recommended for the more severe grades of acromioclavicular joint dislocation (types IV–VI).

If the joint is reduced acutely and held reduced during the healing phase, the native ligaments will heal, restoring the stability of the joint. Traditional open techniques leave a large scar and often require the removal of metalwork. Recently, a number of arthroscopic techniques have been described, but most are complex or necessitate passing material around the coracoids, with the subsequent risk of cutting through the bone and of damage to the brachial plexus as it passes medial to the coracoid. One technique uses a screw that requires later removal.

The TightRope system (Arthrex, Naples, Florida) is a device designed originally for the reduction and stabilization of the tibiofibular syndesmosis of the ankle. It is 2 metal buttons, 1 circular and 1 oblong, joined by a continuous loop of FiberWire suture (Arthrex). This technique provides a simple, reproducible, minimally invasive technique for acute acromioclavicular joint stabilization that enables a rapid return to activity for the acute injury, leaves minimal scarring, and does not require metalwork removal.

**Materials and Methods**

This was a retrospective study. Between January 2006 and May 2007, all patients with acute severe acromioclavicular joint dislocations underwent acute reconstruction using this new arthroscopic technique. The study group comprised 10 men and 1 woman with a mean age of 26 years (average, 30 years; range, 22–42 years) (Table). Three patients sustained type IV and 8 patients sustained type V injuries to the acromioclavicular joint. All injuries occurred while playing rugby, in skiing accidents, or in biking accidents; 8 occurred in the right shoulder and 3 in the left. All patients had a standard postoperative rehabilitation.

One patient was lost to follow-up; therefore, 10 patients attended clinical review. Follow-up occurred at 2 and 6 weeks, 3 months, and then every 6 months postoperatively. The shoulders were evaluated radiologically by comparing the acromioclavicular joint with the contralateral side and clinically by assessing the pain, function, and range of joint motion using the Constant score (where 100 is a perfect score).

**Surgical Technique**

The patient was positioned in the beach-chair position under a general anesthetic. Preoperative antibiotics were administered. A 30° arthroscope was introduced into the glenohumeral joint via a standard posterior port. An anterosuperior portal was created with an outside/in technique using a spinal needle for positioning. A 7-mm partially threaded cannula was inserted into this portal. An anteroinferior portal was created near the tip of the coracoid with an outside/in technique, using the spinal needle to ensure that the base of the coracoids could be visualized. Using a power drill, a 2.4-mm Drill Guide with coracoid drill stop attachment (Arthrex) was prepared with the guide set at 80° and was inserted through the anteroinferior portal. The guide tip was positioned under the base of the coracoid under direct vision as close to the scapula as possible, assisted by fluoroscopy. We made certain that a sufficient bone bridge existed around the 4-mm reamed tunnel. The top of the guide was positioned over the base of the coracoid and strip the bursa and periosteum from the base of the coracoid to obtain a full view of the undersurface. The AC TightRope Constant Drill Guide was inserted through the anteroinferior portal. The guide tip was positioned under the base of the coracoid under direct vision as close to the scapula as possible, assisted by fluoroscopy. We made certain that a sufficient bone bridge existed around the 4-mm reamed tunnel. The top of the guide was positioned over the base of the coracoid directly over the coracoid and a 1.5-cm incision made and continued down to the clavicle. The guide was then positioned in the middle of the superior surface of the clavicle.

Using a power drill, a 2.4-mm Drill Tip Guide Pin (Arthrex) was inserted into the guide pin sleeve and was advanced through the clavicle and coracoid. The tip of the guide pin was captured by the...
drill stop at the base of the coracoid under direct visualization. The position of the pin was checked in relation to the coracoid, and, if incorrect, the guide pin was redrilled. The drill guide was removed, and the guide pin was left in situ. The drill guide was repositioned under the pin to keep it from advancing while reaming. The 4-mm cannulated drill was then passed over the pin and through the coracoid, again under direct vision. The pin was then removed, leaving the drill in situ.

A Nitinol Suture Passing Wire (Arthrex) was passed down through the drill and taken out through the anteroinferior portal using an arthroscopic grasper, leaving the suture loop superiorly. The drill was then carefully removed, leaving the wire in position. The suture leader and needle were removed from the TightRope system (Arthrex). The 2 white traction sutures from the oblong button of the TightRope system passed through the wire loop of the Nitinol Suture Passing Wire, and the button was then flipped to enable the button to pass through the drill hole. The Nitinol Suture Passing Wire was then drawn out of the anteroinferior portal under direct vision. Once the oval button was seen under the coracoid, the trailing suture was used to flip it, locking it under the bone. Once the security of the button was confirmed (Figure 1), the clavicle was then reduced by the surgical assistant; this was assisted by fluoroscopy to confirm reduction. When a satisfactory reduction was achieved, the sutures were tied over the top of the superior button. The wounds were then closed with subcuticular 4.0 suture and adhesive strips.

Postoperatively, the patient was placed in a shoulder immobilizer for 4 weeks. This was removed only for washing and elbow flexion–extension exercises. Motion below shoulder height was permitted until 6 weeks, when full active motion was begun; however, no heavy resistance work was permitted until 3 months.

RESULTS

Mean time to follow-up was 24 months (range, 18-30 months). One failure occurred due to intraoperative technical error (Figure 2); the button that should be set under the coracoid broke through and slipped because it was not centered under the coracoid. An open procedure was performed using the TightRope by making another hole in the coracoid process. Another patient had temporary mild shoulder stiffness that resolved completely. Otherwise, no complications occurred.

All patients reported that they were happy with the outcome of surgery. Mean Constant score was 96.3 (range, 94-99). Radiological review at 6, 12, and 30 months postoperatively revealed that the 10 cases did not show displacement of the acromioclavicular joint in comparison with the other side nor the TightRope (Figure 3). All patients returned to work without pain 12 weeks postoperatively and were satisfied with their functional results and cosmetic appearance. The degree of motion of the glenohumeral joint returned to the pre-injury range of motion in all patients.

DISCUSSION

Acromioclavicular dislocation is one of the most common shoulder injuries seen in general orthopedic practices; however, many injuries do not require surgical intervention. Acute surgical intervention is recommended for more severe grades of acromioclavicular joint dislocation (Rockwood types IV-VI). If the joint is reduced acutely and held reduced during the healing phase, the native ligaments will heal, restoring the stability of the joint.

Surgical options for acromioclavicular dislocation are numerous. Traditional open techniques leave a large scar and often require the removal of metalwork. Advances in instrumentation and implants have produced a recent trend toward the use of arthroscopic approaches. Many of these techniques are similar to those used for ligamentous reconstruction in the knee. Arthroscopic surgery causes less injury to
the soft tissue envelope, but a steeper learning curve for its use exists when compared with open reconstructive procedures.\textsuperscript{21}

The TightRope system is a device originally designed for the reduction and stabilization of tibiofibular syndesmosis of the ankle. It is 2 metal buttons, 1 circular and 1 oblong, joined by a continuous loop of FiberWire. This technique provides a simple, reproducible, minimally invasive technique for acute acromioclavicular joint stabilization that enables a rapid return to activity, leaves minimal scarring, and does not require metalwork removal. This technique is not intended to be used as the sole means of reconstructing a chronic acromioclavicular joint dislocation. It is recommended to delay this minimally invasive procedure if bruises or abrasions are present on site or if blisters or a skin infection are present in the scapular region.\textsuperscript{16} These create an unnecessary risk that may compromise the outcome. In the current study, 1 failure occurred due to intraoperative technical error. Where we did not use the AC TightRope Constant Drill Guide, the hole in the coracoid was not centered, broke through, and slipped. We advise taking the time to be able to see under the coracoid properly.

Nevertheless, we were able to make another hole in an open procedure to fix the joint dislocation. Richards et al\textsuperscript{11} reported a similar problem but in the clavicle side; by using a bigger drill bit, the end button slipped in the clavicle and displaced, which was still acceptable.

Procedures about the coracoid are relatively safe. The lateral cord of the brachial plexus is at greatest risk during dissection about the tip of the coracoid, and the axillary nerve is at greatest risk during dissection about the base of the coracoid. The safety of arthroscopic coracoplasty or interval releases is further increased by the fact that most of the work is performed on the lateral aspect of the coracoid, which is farther away from the neurovascular structures.\textsuperscript{22} Our procedure was performed under direct visualization using a 30° arthroscope, and the portals were lateral to the coracoid process; therefore, the risk of nerve injury was minimized. Arthroscopic coracoclavicular cerclage techniques, which use ligaments or sutures passed around the base of the coracoid, have been described.\textsuperscript{14} This is often done in a blind fashion, raising the potential for damage to the brachial plexus.

Our results are similar to those in the literature.\textsuperscript{11,12,23} No late removal of hardware was routinely required, and the scars were cosmetically acceptable. No significant complications occurred. The patients scored high on functional scoring and were happy with both the functional and cosmetic results.

We have used this system for fractures of the distal clavicle associated with loss of the ligamentous complex. It is also possible to perform the procedure by an open method rather than an arthroscopic method. This repairs the coracoclavicular ligament without needing to remove the metalwork.

REFERENCES


