A Modified Arthroscopic Technique of Gracilis Tendon Graft with Double Fixation System for Treatment of Type V Acromioclavicular Injuries

A Case Report

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Abstract

Case: A 48-year-old male patient with a type V acromioclavicular injury with a 3-tendon acute cuff tear, anterior glenohumeral dislocation, and an axillary posttraumatic neuropathy is presented. The rotator cuff tear was sutured and an all-arthroscopic–modified coracoclavicular ligaments (CCLs) reconstruction technique was performed with a gracilis tendon graft and a double knotless suture fixation system.

Conclusions: An arthroscopic approach allows the surgeon to identify and treat associated glenohumeral lesions in type V acromioclavicular dislocations. In addition, the modified CCL reconstruction technique addresses effectively the AC instability.

Around 9% of shoulder injuries are due to an acromioclavicular dislocation (ACD)[1]. The incidence of this type of injury is increasing because of traffic accidents and sports injuries[2]. This type of injury is more frequent in men and is the consequence of high-energy impacts on the shoulder. ACD type I-II-III of the Rockwood classification is usually treated conservatively because the residual instability is well tolerated. However, ACD type IV-V-VI needs surgical management because of pain and dysfunction if left untreated.

Currently, there is no gold standard technique for the treatment of ACD. Therefore, we present a case report of an arthroscopic technique, which consists of a gracilis graft (GG) reinforced with a double titanium button fixation system for the management of type V ACD.

The patient was informed that data concerning the case would be submitted for publication, and he provided consent.

Case Report

A 48-year-old, right-handed, male patient, suffered a 3-m fall while practicing zip-line with direct trauma to his right shoulder. On the physical examination, patient had a painful deformity of the acromioclavicular (AC) joint. Active range of motion (ROM) was 30° of flexion, 30° of abduction, and −15° of external rotation and internal rotation limited to the greater trochanter. The Jobe test, belly press, and lag sign were all

Fig. 1

Anteroposterior radiograph showing a Rockwood type V acromioclavicular dislocation of the right shoulder. A coracoclavicular (CC) separation greater than 100% compared to the left side is appreciated. A lateralization of the scapula can be watched.

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Disclosure: The **Disclosure of Potential Conflicts of Interest** forms are provided with the online version of the article (http://links.lww.com/JBJSCC/A835).

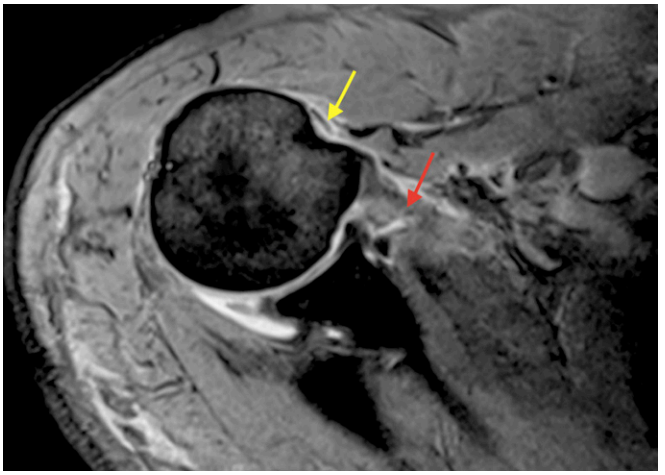

Fig. 2

Fig. 3

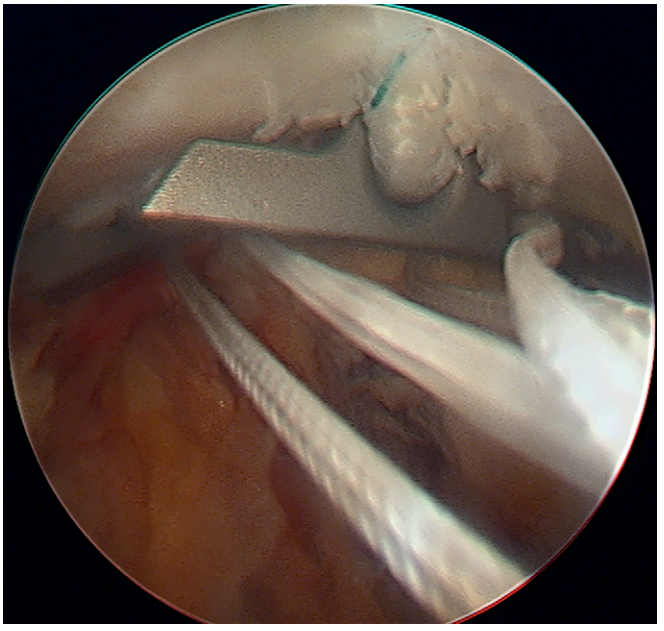

Fig. 4

Fig. 2 Axial magnetic resonance imaging of the right shoulder showing dislocation of the long head of the biceps (yellow arrow) and lesion of the subscapularis tendon (red arrow). **Fig. 3** Patient in beach chair with head and neck support. The arthroscopic portals and references on the right shoulder are marked for surgery. **Fig. 4** Subcoracoid view of the graft and fixation system from the J arthroscopic portal.

positive. In addition, he referred numbness in the lateral portion of the shoulder.

The X-ray demonstrated a Rockwood type V ACD and a posttraumatic lateralization of the scapula (Fig. 1). A magnetic resonance imaging (MRI) and a preoperative electromyographic study were also requested to assess associated shoulder injuries. The MRI showed a lesion of the subscapularis, supraspinatus, and infraspinatus tendons (Fig. 2) and the electromyography concluded a partial lesion of the axillary nerve compatible with a posttraumatic neuropathy.

Surgical Technique

The procedure was performed in beach chair position (Fig. 3).

First, the GG was obtained using the technique described by Colombet and Graveleau[3].

Next, a complete nonretracted rotator cuff tear (RCT) was visualized affecting the supra and infraspinatus tendons. In addition, the patient had a grade II subscapularis tendon rupture (Lafosse classification) that involved a medial dislocation of the long head of the biceps. There was no Bankart or Hill-Sachs lesion.

A tenotomy of the long head of the biceps was performed. The rotator interval was opened and the subscapularis, supraspinatus, and infraspinatus muscle tendons were repaired with all-suture anchors (JuggerKnot Anchor). After repairing the cuff in a double-row configuration, the coracoid was exposed detaching the coracohumeral and coracoacromial ligaments as well as detaching the pectoralis minor tendon, through an I anterior visualization portal and both J and E working portals. The anteroinferior J portal is performed midway between D and I portal (anterior axillary fold). It is located in front of the subscapularis. There is no risk of damaging neurovascular structures as it is lateral to the coracoid process.

Following the cuff repair, we performed the reconstruction of the coracoclavicular ligament (CCL) using a modification

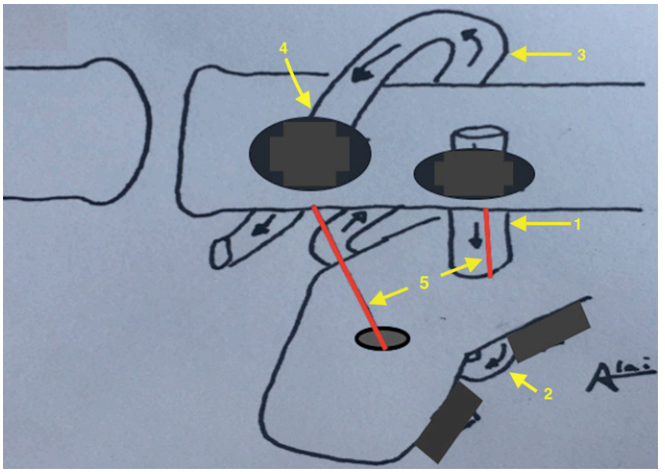

Fig. 5

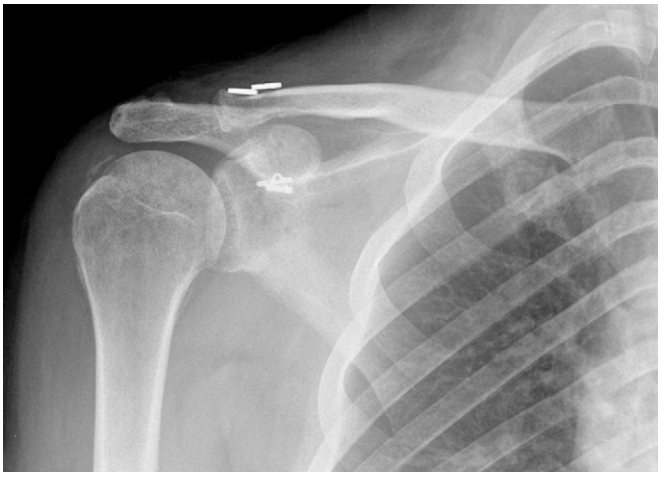

Fig. 6

Fig. 5 Step-by-step illustration of the coracoclavicular ligament reconstruction: (1) The graft was loaded and passed through the hole in the base of the coracoid and the medial clavicular tunnel. (2) The graft was retrieved through the inferior aspect of the coracoid. (3) The graft was passed around the posterior wall of the clavicle. (4) The graft was transferred into the lateral hole of the clavicle. (5) The 2 fixation devices were passed through the holes (the grey metallic parts with the red line represent the ZipTight Fixation System® devices, tensioned under the coracoid process and over the ligamentoplasty).

Fig. 6 Anteroposterior radiograph of the right shoulder showing reduction of the type V acromioclavicular dislocation.

of the technique described by Ranne (which uses a semitendinosus graft in a figure of 8 configuration combined with a single fixation device)[4].

In our modified technique, two 4.5 mm tunnels were drilled in the distal clavicle (2 cm approximately medial from the ACJ for the trapezoid ligament and 4 cm medial from the ACJ for the conoid ligament) by a miniopen incision. In the coracoid process, the posterior coracoid tunnel was located at the base of the coracoid through J portal and the anterior coracoid tunnel was performed with the guide inserted through D portal. Both of them were performed with the AC guide (Biomet) to avoid penetrating too far and damaging the neurovascular structures.

Then a CHIA PERCPASSER suture passer (DePuy Synthes) wire was introduced through the medial clavicular tunnel and the posterior coracoid tunnel and 2 sutures were passed with it to be used as a suture relay: one for loading and passing the graft and the other one to pass the ZipTight device. Then, the graft was loaded and passed through the hole in the base of the coracoid and the medial clavicular tunnel. The plasty was then retrieved through the inferior aspect of the coracoid (Fig. 4) and taken out around the posterior wall of the clavicle and transferred into the lateral hole of the clavicle, hugging the clavicle on the posterior part in a V-shape configuration. Finally, the 2 fixation devices (ZipTight, Biomet Orthopedics) were passed through the holes (one fixation device from the lateral clavicle to the anterior hole in the coracoid, and the other from the medial clavicle to the base of the coracoid (Fig. 5)), using both D and J portals, for retrieving the sutures and visualization, respectively. Finally, reduction and fixation of the type V ACD were performed by blocking the graft with the ZipTight devices after tensioning the reconstruction (Fig. 5). The final reduction of the ACD was verified by fluoroscopy (Fig. 6).

Postoperatively, the patient wore a sling for 6 weeks. Six months after surgery, the patient had completely recovered sensitivity. In the last follow-up, one year after surgery, the patient had almost complete ROM with decreased abduction strength and a constant score of 80 points. In addition, there were no clinical nor radiological signs of AC instability.

Discussion

Surgical management in a Rockwood type V ACD is the first choice of treatment because there is a higher prevalence of pain, AC instability, and dysfunction associated with conservative treatment.

Currently, there are 2 possibilities for surgical treatment: the first is based on the use of rigid fixation systems that allow injured ligaments to heal and the second is based on the reconstruction of the CCL with grafts associating suture fixation devices, which allow more micromotion during healing resembling the patient's true joint mechanics.

The first option has been replaced progressively because rigid systems usually showed a higher rate of complications and required a second intervention for their removal[5,6]. Therefore, in the last years, there has been a grown interest in innovative designs of synthetic devices that have progressively evolved to be used arthroscopically.

An arthroscopic approach is very important both to rule out concomitant pathology and to provide definitive treatment. This fact is important because type V ACD is associated with other glenohumeral lesions in up to 53% of patients, with RCT being the most common ones[7], which are more difficult to assess with an anterior open approach[8].

The modified technique described is unique because it reconstructs the CCL anatomically through GG and a double suture fixation device to provide stability.

In the literature, a large part of the case series included type V ACD in the same treatment group as type III ACD, possibly because of the low incidence of type V. We believe that it is imperative to differentiate the different types as for neither the number and nature of associated lesions nor the repair technique should be the same.

The loop of the semitendinosus graft described by Ranne et al. allows to reconstruct the CCL effectively in a figure of 8 configuration. In our case, we decided to design a V shape configuration to take advantage of the 2 tunnels created to reproduce the anatomy and confer additional stability with the 2 fixation devices. More specifically, the medial clavicle fixation device reproduced the function of the conoid ligament whereas the lateral clavicle fixation device reproduced the trapezoid ligament. The GG usually has a smaller thickness than the semitendinosus and this characteristic allowed us to pass the graft without difficulties through the 4.5-mm holes in the clavicle and the coracoid. The tunnel size chosen in the coracoid (4.5 mm instead of 6 mm as proposed by other authors) was also crucial because it decreases the risk of iatrogenic fracture[4]. Also, an essential aspect was that the graft was passed transfixing the coracoid, unlike other techniques that only surround it, which provided additional intrinsic stability.

The combination of the graft and the double ZipTight system allowed an optimal reduction with great vertical and horizontal stability, not only because of the V-shaped configuration but also because the graft transfixed the coracoid while it hugged the posterior cortical wall of the clavicle and in turn brought the clavicle back down through the lateral hole (Fig. 5). The fixation of the graft in both tunnels of the clavicle was done by tension and compression of the button in the dorsal aspect of the clavicle, avoiding interference screws that could have caused a iatrogenic fracture or resorption problems[9,10].

Regarding the limitations of our technique, it is a technically demanding procedure. It is also essential to emphasize possible complications such as the possible risk of fracture of the coracoid while drilling the 2 tunnels and therefore this step should be done with caution[11,12]. Other complications are related with the passage of the sutures or the graft, which may increase the procedure time. Finally, this is a case report describing a surgical technique used to treat a type V ACD; a larger sample size should be analyzed to further investigate this stabilization method.

In conclusion, the arthroscopic approach allows treating a type V Rockwood ACD as well as associated glenohumeral and RCT. In addition, the GG in such a configuration and with the double fixation device reproduces the damaged CCL and may confer vertical and horizontal stability to the AC joint, improving pain and restoring shoulder function. ■

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