

Hardware free anatomical acromioclavicular joint reconstruction using augmented semitendinosus tendon graft in acute injury.

Amr Saber Elsayed¹, MD and Samy Abdelhady Sakr², MD

Orthopedic Department, Faculty of Medicine,
Menoufia University

1- Assistant Professor of Orthopedic Surgery,
Faculty of Medicine, Menoufia University-
Egypt.

**Corresponding author and reprint: Amr
Saber Elsayed**

2- Lecturer of Orthopedic Surgery, Faculty of
Medicine, Menoufia University- Egypt.

Gamal Abdel Nasser Street, Shebin El Kom,
Menoufia Governorate, Egypt

Telephone: 00201110935566

Fax: 0020482317508

Email: saberamro72@gmail.com

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Abstract

Background

Acromioclavicular joint injury (ACJ) is one of the most common shoulder injuries in a young active population. Surgical treatment of AC joint injury is indicated in grade IV & V Rockwood injuries or in those patients in whom conservative treatment has failed. The use of semitendinosus graft for AC joint reconstruction became the most popular procedure in the last decade, especially with improved outcome scores compared with the non-anatomic procedures.

Patients

This was a retrospective study of 20 cases of ACJ injury; those had been operated in El Menoufia University Hospital between September 2017 and May 2019. They were grade IV and V according to Rockwood classifications. 13 (65%) patients were males and 7 (35%) were female, with age ranging from 22 to 56 (average 39). 14 (70%) were right and 6 (30%) were left. They were all due to a direct fall on the shoulder. They were all operated within 3 to 21 days after injury.

Patients & Methods

Semitendinosus graft was harvested in the usual manner and prepared. Complete exposure of the lateral aspect of the clavicle, ACJ, and the coracoid was done. Two tunnels were then drilled in the clavicle from superior to inferior at 2.5 and 4.5 cm from the ACJ. A third tunnel then was drilled into the acromion from superior to inferior, 1 cm posterior to its anterior end. The graft was then passed under the coracoid with its free ends on the superior surface of the clavicle. The free ends of the graft were tied and then sutured to each other. The long lateral end of the graft was passed through the acromion from up down then re-sutured to the graft on the sub-clavicular space.

Results

Radiologically, the mean CC distance in the injured side became 12 +/- 2mm instead of 18 mm +/- 2 pre-operatively. As regard AC distance, at the last follow up there were 4 cases (20%) of partial loss of reduction (AC distance 3-4mm). Functionally, the UCLA score improved from 7 (5-9) pre-operatively to 30 (28-33) at the last follow-up. All patients were satisfied even those 4 cases that showed a radiological gradual loss of reduction.

Conclusion

In acute ACJ dislocation, hardware-free double tunnel reconstruction using augmented semitendinosus graft represented a safe, cheap method of treatment with good radiological and functional outcomes.

Keywords

Acromioclavicular joint; semitendinosus tendon graft; Shoulder.

Introduction

Acromioclavicular joint (ACJ) injury is one of the most common shoulder injuries in young active population with an incidence of about 9.2 per 1000 per year, with a higher incidence in males[1]. These injuries are mostly seen with direct trauma to the shoulder as a blunt force hits the acromion with the shoulder in an adducted position.

The AC joint acts as a sling that connects the scapula to the clavicle as well as to support the upper extremity. Movement of the clavicle is controlled by the 2

components of coracoclavicular (CC) ligament that controls its movement in different planes during movement of the shoulder[2]. Like all joints, the AC joint has both static and dynamic stabilizers. The static stabilizers are the capsule, AC ligaments, CC ligaments, and deltotrapezial fascia. The dynamic stabilizers are the trapezius and deltoid muscles[3].

Kilmkiewicz et al in a mechanical study demonstrated that more than 80% of the horizontal stability of the AC joint is due to intact posterosuperior capsuloligamentous structures. In chronic cases, all these stabilizers are injured[4].

Ac joint injuries result in different symptoms that depend on the force as well as the degree of injury. These symptoms include shoulder pain, Muscle fatigue (deltoid and trapezius), scapular instability, and even neurological symptoms due to traction forces[5].

Surgical treatment of AC joint injury is indicated in grade IV & V Rockwood injury or in those patients in whom conservative treatment has failed.[6]

Patients and methods

This was a retrospective study of 20 cases of ACJ injury, those had been operated in our university hospital between September 2017 and May 2019. They were grade IV and V according to Rockwood classifications. 13 (65%) patients were male and 7 (35) were female, with age ranging from 22 to 56 (average 39). 14 (70%) were right and 6 (30%) were left. They were all due to a direct fall on the shoulder. They were all operated within 3 to 21 days after injury.

Method:

-Anesthesia: they were all operated under general anesthesia. 1 gm of 3rd generation cephalosporin was given with induction.

-Position: All cases were operated in the beach-chair position.

-Draping: Both the affected shoulder and ipsilateral lower limb were sterilized and draped.

- Graft: Semit graft was harvested in the usual manner

and prepared on the side table by an assistant. No 2 fiber-wire was whip stitched at both ends of the graft to facilitate its passage. The incision was then closed, and the graft is soaked in vancomycin.

-Approach: An oblique 5 cm incision was made starting superolateral at ACJ and extending downward and medially towards the coracoid. The incision was carried sharply to the delto-trapezoid fascia with complete exposure of the lateral aspect of the clavicle and ACJ. Then, we proceed to the coracoid exposure through the careful release of pectoralis muscle from its medial side and passing a 90-degree hemostat below it. The hemostat was used to grasp a looped suture that would pull the graft around the coracoid.

2 tunnels were then drilled in the clavicle from superior to inferior at 2.5 and 4.5 cm from the ACJ to reconstruct the trapezoid and conoid ligaments respectively, using a 4.5 mm drill bit. Another looped suture was then passed through the tunnels to facilitate and guide graft passage.

A third tunnel then was drilled into the acromion from superior to inferior, 1 cm posterior to its anterior end using the same drill bit.

The graft was then passed under the coracoid with its free ends on the superior surface of the clavicle. The free ends of the graft were tied and then sutured to each other. The long lateral end of the graft was passed through the acromion from up down then re-sutured to the graft on the sub-clavicular space. The graft was augmented with No.5 ethibond.

-Finally, the wound was closed in layers, and the patient was placed in a broad arm sling.



Fig. 1: A- pre-operative x-ray, B- incision for semit graft, C- Graft preparation. D- Incision and AC joint exposure, E-Clavicle tunnels, F- final construct.

Post-operative care & rehab. Protocol.

- 1- The injectable antibiotic was administered (3rd generation cephalosporin for 2 days then oral antibiotic for 1 week).
- 2- Stitches were removed on the 10th post-operative day.
- 3- The patient remained in a sling for 4 weeks and only passive movement was allowed during this period. The active range was started for the next 4 weeks and when it was fully regained strengthening exercises were then allowed. This was performed under the supervision of a physiotherapist.
- 4- X-ray was performed in 1st post-operative day to assess reduction and tunnel position, then for follow up after 6 weeks, 12 weeks, and 6 months.

Evaluation:

1- Radiographic:

-The acromioclavicular distance (measured between the inferior cortex of the clavicle and the acromion), in AP view of the shoulder, was the indicator of reduction of ACJ post-operative and maintenance of reduction in follow-up visits. This measure can be classified into 4 groups:

- 1- Anatomic (<2mm distance)
- 2- Slight loss of reduction (2-4 mm)
- 3- Partial loss of reduction (4-8mm)
- 4- Dislocation (>8 mm) [7]

-We also measured the coracoclavicular distance (CCD) from the superior cortex of the coracoid to the inferior clavicular cortex. The CCD was measured and compared with that of the contralateral non-injured side. A percentage of 25% more, was chosen for the diagnosis of dislocation and loss of reduction in follow-up[8]

2-Clinical evaluation

All shoulders were evaluated using the University of California and Los Angeles (UCLA) rating scale[9]

Results

Radiological

-The mean CC distance on the injured side was 18 mm +/- 2 (pre-operatively) with a mean difference of 53-80% of the other side (ranged from 10-13 mm). At the last follow-up visit, it was 12+/- 2mm.

- As regards AC distance, only 2 cases (10%) were not completely reduced in the immediate post-operative x-ray (about 2 mm distance). At last, follow

up there were 4 cases (20%) of partial loss of reduction (AC distance 3-4mm)

Functional evaluation

UCLA score improved from 7 (5-9) pre-operatively to 30 (28-33) at the last follow-up. All patients were satisfied even those 4 cases that showed a radiological gradual loss of reduction.

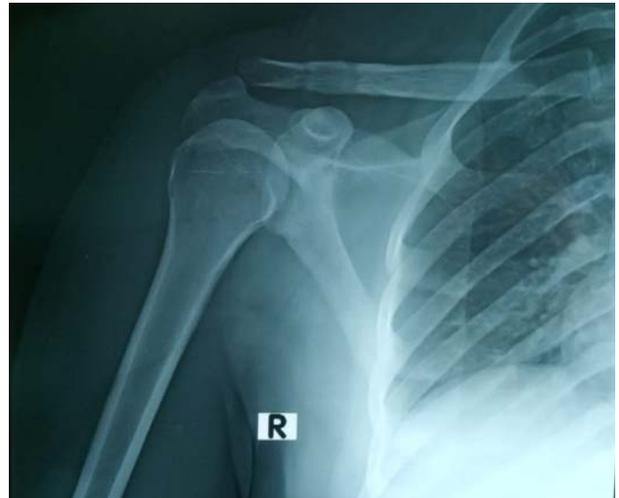


Fig 2: post-operative x-ray showing 2 tunnels of the clavicle with complete reduction of AC joint after 6 months

Discussion

Despite numerous surgical procedures (anatomic and non-anatomic) for ACJ reconstruction, there is no consensus in the literature as an optimal surgical technique. The non-anatomic procedures have many disadvantages, for example, coracoacromial ligament transfer will displace the clavicle anteriorly causing permanent deformity[10].

The use of semitendinosus graft for AC joint reconstruction became the most popular procedure in the last decade, especially with improved outcome scores compared with the non-anatomic procedures. Lee et al studied the load to failure in native ligament and semitendinosus and the result with nearly equal[11]. However, the graft demonstrated gradual loss of strength showing 30-40% ultimate load strength[12].

One of the main issues with ACJ reconstruction is a technical failure and gradual loss of reduction with different methods of fixation. There was a 32% rate of post-operative instability with tension band, 50% late instability with a hook plate, and 34% of late instability with polydioxanone suspension (13). In our series, there was a gradual loss of reduction in 4 cases (20%). Many surgeons do not consider the loss of reduction a complication as the patient is satisfied and

returned to his pre-injury activity. For example, Shin et al[14] reported no difference in constant score between both groups, with and without loss of reduction[13]. Maurena et al[15] studied the results in 16 patients in whom one fourth showed loss of reduction, however, the constant score was 97%. In our series, the UCLA score is 30 despite the loss of reduction in 4 patients, and all patients returned to pre-injury activity.

There are several limitations to our study. First, the number of our sample and the length of follow-up, as evaluation of the technique requires a larger number of cases and longer follow-up that may display different results. Also, there should be a comparative study with this technique and other methods of treatment whether open or arthroscopic and different methods of fixation (hook plate, end button, etc.).

Conclusion

In acute ACJ dislocation, hardware-free double tunnel reconstruction using augmented semitendinosus graft represented a safe, cheap method of treatment with good functional outcome.

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