Reconstruction of Acromioclavicular Joint Dislocation with Hamstrings Autograft


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Abstract

Background: The aim of the current study is to evaluate the technique of reconstruction of Acromioclavicular (AC) joint dislocation using tendon autograft (semitendinosus) and to assess clinical, radiographic results and complications associated with this procedure.

Methods: This is a prospective study was conducted on 20 patients with 20 dislocations from May 2013 till March 2014 including patients with Acromioclavicular joint dislocation (AC joint) presenting to Kasr Al-Ainy Hospital (Level I Trauma Centre) treated by reconstruction with Semitendinosus autograft, 16 patients were followed-up with mean age was 32.4±9.3 years and mean follow-up duration was 6.8 month, 4 patients lost in follow-up.

Results: 20 patients with twenty AC joint dislocations were included in this study, 16 patients were followed-up and 4 patients were lost in follow-up. We followed the patients for postoperative pain, activity level, arm positioning, and strength of abduction in pounds, range of motion. Preoperative 2 patients had severe pain 13 moderate and 1 mild, postoperative 6 patients had no pain, 10 patients had mild pain, preoperative 1 patient had unaffected sleep and 15 were affected, postoperative 11 patients had unaffected sleep and 5 patients had affected sleep. Preoperative 2 patients could engage in recreational sports and 14 couldn't, postoperative 11 could and 5 couldn't, 14 patients couldn't return to work preoperative and 2 could, postoperative 10 patients had >24 pounds and 4 patients had 22-24 pounds. Constant score was poor for the 16 patients preoperative and excellent for 11, good for 3, fair for 1 and poor for 1 patient postoperative.

By X-ray 14 patients had complete reduction, 2 patients had subluxation <25% immediate postoperative while 10 patients had complete reduction at last follow-up and 6 patients had >25% subluxation.

Conclusion: The results of coracoclavicular reconstruction using semitendinosus graft have been very promising, safe and feasible surgical technique to treat acute and chronic acromioclavicular joint dislocation. However, the patient should be compliant to the rehabilitation protocol to ensure an optimal outcome of the reconstructive procedure.

Level of Evidence: Level IV case series study.

Key Words: Acromioclavicular joint dislocation – Coracoclavicular ligament reconstruction – Semitendinosus autograft.

Introduction

INJURY to the Acromioclavicular (AC) joint accounts for nearly half of all sports-related shoulder injuries [1]. Dislocation of the acromio-clavicular joint commonly occurs in young adults following a fall with direct impact onto the shoulder. This produces a sprain followed by rupture of the acromio-clavicular ligaments with loss of horizontal stability. With increasing force, rupture of the coraco-clavicular ligaments with displacement of the lateral clavicle occurs with loss of vertical stability, producing a complete dislocation. The upper limb loses its suspensory support from the clavicle with downward displacement of the shoulder and, to a lesser extent, an up-pull of the clavicle by trapezius [2].

Low grade injuries often can be conservatively managed, as the coracoclavicular ligaments remain intact and keep the clavicle in close proximity to the scapula. However, higher grade injuries result in the complete disruption of these ligaments and often result in both inferosuperior and anteroposterior instability. Operative stabilization often is indicated and can minimize the discomfort and disability associated with this instability. The unstable AC joint has been treated with a multitude of operative techniques over time, with many reporting good to excellent outcomes [3].

The use of grafts for reconstruction of the acromioclavicular joint was first reported by Jones

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and coworkers. In their study, an autogenous semitendinosus tendon graft was used to reconstruct the acromioclavicular joint [4].

In various biomechanical studies, the structural properties of the normal coracoclavicular ligament complex [5-7] were tested and compared with reconstruction techniques.

In a 2004 study by (Costic et al., 2004) the structural properties of the semitendinosus tendon graft as an anatomic reconstruction technique were compared with the intact coracoclavicular ligaments. They concluded that this graft can be used to replicate the course of the ligaments and provide stability to the clavicle that is very close to that provided by the intact ligaments, with the advantages of autogenous tissue [8].

Material and Methods

This is a prospective study was conducted on 20 patients with 20 dislocations from May 2013 till March 2014 including patients with Acromioclavicular joint dislocation (AC joint) presenting to Kasr Al-Ainy Hospital (Level I Trauma Centre) treated by reconstruction with Semitendinosus autograft, 16 patients were followed-up with mean age was 32.4±9.3 years and mean follow-up duration was 6.8 month, 4 patients lost in follow-up.

The patients’ ages ranged from 21 to 50 years with mean age 32.4 years. There were 2 females (12.5%) and 14 males (87.5%).

Out of 20 patients; 15 patients (93.7%) were injured on their dominant hand side and one patient (6.3%) was left handed his injury was on the non-dominant hand side. All the patients were assessed by plain X-rays preoperatively, the dislocation were classified according to Rockwood’s; 10 patients (62.5%) were grade III and 6 patients (37.5%) were grade IV. 3 patients (18.8%) were of acute onset and 13 (81.2%) patients were of chronic onset.

We included all patients with acute and chronic ACJ dislocation type (III, IV, V, VI) and excluded patients with coracoid fractures, chronic ACJ dislocation type (I, II), acute ACJ dislocation, ongoing infections and rotator cuff tear.

The patients were assessed by history, clinical examination and laboratory investigations (CBC, PT, PC, INR, Urea, Creatinine, AST, ALT). Standard shoulder examination was performed for all the included patients regarding tenderness, range of motion, swelling, skin condition, neurovascular examination and constant score for preoperative and postoperative assessment. We used dynamometer for measurement of strength of abduction and inclinometer for range of motion.

All patients were evaluated by plain X-rays (A-P and Zanca views) preoperatively, preoperative imaging was used to classify the patient’s dislocation and plan surgery.

Surgical technique:

All the patients were anaesthetized by general anaesthesia. Patients were placed in the beach-chair position.

The semitendinosus tendon was harvested through a 5cm longitudinal incision over the pes anserinus from the ipsilateral knee using a stripper.

The graft was prepared on the back table by tabularizing each end of the semitendinosus autograft with no. 2 sutures to allow it to be passed through the bony tunnels.

A strap incision was started from the acromioclavicular joint and extended distally towards the tip of coracoid process allowing for visualization of the distal clavicle and coracoid. The deltopectoral groove was identified and the cephalic vein was retracted medially. The coracoid was identified as well as the conjoined tendon and pectoralis minor attachments on the coracoid.

The plane was developed between deltoid and pectoralis major. The superior aspect of the distal clavicle was exposed over its borders by subperiosteal dissection to allow for complete visualization from its lateral aspect to the level of the normal coracoclavicular ligament attachment medially on the clavicle, leaving the anterior deltoid attachment on the clavicle intact. 10mm of the distal clavicle was removed in a perpendicular fashion using an oscillating saw.

We then prepared for placement of the semitendinosus graft by first drilling a hole using a acanulated reamer 6mm, superior to inferior, the 2 holes were around 1 cm apart and the lateral hole was around 2 to 2.5cm proximal to the distal end of the clavicle and at approximately the anterior third of the distal clavicle at the region of the normal coracoclavicular ligament attachment.

The graft was passed from inferior to superior through the distal clavicle tunnel. Looping the graft around the base of the coracoid process could be facilitated by the use of a curved aortic cross-clamp (Satinsky clamp) and a suture-passing device. The 2 arms of the graft were pulled under
the deltoid by axial traction until the distal clavicle elevation was completely reduced.

The tail ends of the graft were tied in a square knot fashion then one end were passed anteriorly on the anterior border of the clavicle, the second passed posteriorly, looped again under the coracoid, and another square knot tied in the subclavicular space.

A no. 2 nonabsorbable suture was placed through the deltotrapezial fascia in a modified Mason-Allen fashion. Subdermal skin was closed with 2-0 or 3-0 absorbable suture. Skin was closed with a 2-0 suture in a running or interrupted fashion, taking care to evert the skin edges. A compression dressing was applied. The arm was placed into a sling in 0 degrees of external rotation and with an upward force on the arm.

The patient remained in the hospital overnight, and prophylactic parenteral antibiotics were administered for the first 24 hours postoperatively.

The shoulder was placed into an immobilizer (arm sling) for the following 6 weeks.

Early passive motion according to pain tolerance was started after the first postoperative day. Pendulum exercises were permitted in the first week after surgery.

6 weeks postoperative, the patient began active assisted motion at home or in a supervised physical therapy program.

Table (1): Sex distribution.

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Table (2): Age distribution between age groups.

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<tr>
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<td>12.5</td>
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Fig. (1): Instrumented measurements of preoperative range of motion with inclinometer.

Fig. (2): Patients were placed in the beach-chair position.

Fig. (3): The semitendinosus graft was harvested from the ipsilateral knee.

Fig. (4): Incision is started from the acromioclavicular joint towards the tip of coracoids process.
Fig. (5): Distal 10mm of the clavicle was removed using an oscillating saw.

Fig. (6): 2 drill holes were prepared on the superior cortex of the clavicle using a 6-mm drill bit.

Fig. (7): The graft was passed from inferior to superior through the clavicle tunnels.

Fig. (8): The tail ends of the graft were tied in a square knot fashion.

Results

20 patients with twenty AC joint dislocations were included in this study, 16 patients were followed-up and 4 patients were lost in follow-up.

We followed all patients pre and postoperative after 6 month with constant score.

11 patients had excellent outcome, 3 patients had good outcome, one patient had fair outcome and one patient had poor outcome.

X-ray:

14 patients had complete reduction, 2 patients had subluxation <25% immediate postoperative,
10 patients had complete reduction at last follow-up and 6 patients had >25% subluxation.

Complications:
Only 2 patients had superficial skin infection at the operation site responded to oral antibiotics.

In our study 20 patients underwent AC joint reconstruction with autogenous semitendinosus graft, 10 patients (62.5%) with grade III, 6 patients (37.5%) with grade V AC joint dislocation classified according to Rockwood’s classification, 17 patient (81.2%) were chronic patients, 3 patients (18.8%) were acute. The mean follow-up period was 6.8 months (range 11-6 months), 12 patients (68.8%) had excellent outcome according to constant score, 3 patients (18.8%) had good outcome, one patient (6.3%) had fair outcome and one patient (6.3%) had poor outcome, this patient did not follow postoperative rehabilitation program the mean constant score was 89 ± 10.1 (range, 100-63), radiographs at last follow-up showed complete reduction in 10 patients (68.5%) and subluxation in 6 patient (37.5%); 2 patients early post operative, raised to 3 patients after 3 months then 6 patients at last follow-up, all were <25% subluxation, with non prominent effect on postoperative clinical and range of motion outcome.

**Discussion**

The primary functions of the acromioclavicular joint are to transmit force from the appendicular skeleton to the axial skeleton and to suspend the upper extremity [9]. Stability across the acromioclavicular joint is achieved through a strong ligamentous complex. Urist demonstrated that with transaction of the acromioclavicular joint capsule, instability is produced in the posterior direction, whereas with transaction of the coracoclavicular ligament, instability occurs superiorly. Detachment of the surrounding musculature such as the deltoid and trapezius can lead to posterior dislocation, as well as superior subluxation [10].

Since the very early first surgical operation on the AC dislocation conducted by Cooper in 1861, several different techniques have been proposed. There has been much controversy over the surgical treatment of traumatic acromioclavicular joint dislocation.

The most popular procedures include the transfer of the coracoclavicular ligament to the outer clavicle as popularized by Weaver and Dunn [11]. This requires a substantial anterior incision with partial detachment of the deltoid origin leaving a prominent scar there is transfer of an intact structure with a non anatomical anterior pull on the clavicle [12]. Coracoclavicular screw fixation as described by Bosworth does not allow acromioclavicular joint debridment or coracoclavicular ligament reconstruction and has been associated with hardware failure and osteolysis of the clavicle [13]. Intraarticular acromioclavicular fixation using pins or K-wires can lead to infection or migration and necessitate removal [13].

Anatomical acromioclavicular joint reconstruction was designed to place tendon grafts at the exact anatomic location of the coracoclavicular ligaments, besides avoiding the need for implant removal and complications such as hardware migration, infection, and foreign body reaction acromioclavicular joint reconstruction using tendon grafts is biomechanically superior to coracoclavicular ligament transfer this was demonstrated by (Lee et al., 2008) in a controlled laboratory study, whereby reconstruction using coracoclavicular ligament transfer with or without augmentation, and a semitendinosus tendon were subjected to loading cycles. Only the semitendinosus tendon survived both clinically this should translate to a strong and stable biologic option for acromioclavicular joint reconstruction [14].

**References**


