

Comparative Study of Hamstrings Autograft vs Double Loop Suture Repair for Reconstruction of Acromioclavicular Joint Dislocation

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

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

Methods: This is a prospective study was conducted on 30 patients with 30 dislocations from May 2019 till January 2021 including patients with Acromioclavicular joint dislocation (AC joint) presenting to Dr DY PATIL Medical College and Hospital half of which were treated using reconstruction with Semitendinosus autograft and other half with double loop suture repair. The patients were followed-up with mean age being 32.4+-9.3 years and mean follow-up duration was 6.8 month, 6 patients lost in follow-up.

Results: 30 patients with 30 AC joint dislocations were included in this study,24 patients were followed-up and 6 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. 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 re construction using semitendinosus graft have been very promising, safe and feasible surgical technique to treat acute and chronic acromioclavicular joint dislocation than the double loop suture repair. However, the patient should be compliant to the rehabilitation protocol to ensure an optimal outcome of the reconstructive procedure.

Keywords: Semitendinosus graft; double loop technique; rockwood; ac joint; reconstruction.

1. INTRODUCTION

Injury to the Acromioclavicular (AC) joint accounts for nearly half of all sports-related shoulder injuries [1]. Dislocation of the acromioclavicular joint commonly occurs in young adults following a fall with direct impact onto the shoulder. This produces a sprain followed by rupture of the acromioclavicular ligaments with loss of horizontal stability. With increasing force, rupture of the coracoclavicular 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 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, 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 [8-10].

2. MATERIALS AND METHODS

This is a prospective study was conducted on 30 patients with 30 dislocations from May 2019 till January 2021 including patients with Acromioclavicular joint dislocation (AC joint) presenting to Dr DY PATIL Medical College Hospital treated by reconstruction with Semitendinosus autograft, 24 patients were followed-up with mean age was 32.4±9.3 years and mean follow-up duration was 6.8 month, 6 patients lost in follow-up.

The patients' ages ranged from 20 to 49 years with mean age 32.4 years. There were 8 females (33.3%) and 16 males (66.6%).

Out of 30 patients; 20 patients (66.6%) were injured on their dominant hand side and 10 patients (33.3%) were injured 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.

2.1 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 allowed 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 an acannulated 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

	Male	Female
Count	16	8
Percent	66.6	33.3

3. RESULTS

Thirty patients with twenty AC joint dislocations were included in this study, 24 patients were followed-up and 6 patients were lost in follow-up.

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

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



Fig. 1. Pre operative x ray shoulder ap



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



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



Fig. 4. Graft is introduced in tto the ac joint



Fig. 5. The graft was passed from inferior to superiorthrough the clavicle tunnels



Fig. 6. The tail ends of the graft were tied in a square knot fashion



Fig. 7. Post operative x ray after fixation

Table 2. Age distribution between age groups

	20-24 years	25-29 years	30-34 years	35-39 years	40-44 years	45-49 years
Count	6	8	3	1	3	3
Percent	25	31.2	12.5	6.3	12.5	12.5

Table 3. Range of motion

Patient	Age/sex	Side	Range of motion pre-operative			Technique	Range of motion post-operative		
			Flexion	Extension	Abduction		Flexion	Extension	Abduction
1	47/M	RIGHT	0	0	0	DOUBLE LOOP	90	20	110
2	30/M	RIGHT	0	0	0	GRAFT	140	50	150
3	40/M	LEFT	0	0	0	GRAFT	150	60	150
4	25/M	RIGHT	0	0	0	GRAFT	160	55	170
5	45/M	LEFT	0	0	0	GRAFT	165	60	170
6	36/M	LEFT	0	0	0	DOUBLE LOOP	125	25	130
7	23/M	RIGHT	0	0	0	DOUBLE LOOP	120	25	120
8	45/F	LEFT	0	0	0	GRAFT	140	60	145
9	34/F	RIGHT	0	0	0	GRAFT	145	60	140
10	36/M	RIGHT	0	0	0	DOUBLE LOOP	115	20	125
11	38/F	RIGHT	0	0	0	GRAFT	135	25	130
12	44/M	RIGHT	0	0	0	GRAFT	120	20	110
13	25/M	RIGHT	0	0	0	DOUBLE LOOP	110	20	120
14	28/F	LEFT	0	0	0	DOUBLE LOOP	100	20	110
15	33/M	LEFT	0	0	0	GRAFT	145	55	160
16	22/M	LEFT	0	0	0	GRAFT	165	55	170
17	23/F	LEFT	0	0	0	GRAFT	160	55	170
18	25/F	LEFT	0	0	0	GRAFT	160	55	170
19	50/M	RIGHT	0	0	0	GRAFT	165	50	170
20	52/M	RIGHT	0	0	0	GRAFT	165	60	170
21	32/M	RIGHT	0	0	0	GRAFT	140	60	150
22	35/M	LEFT	0	0	0	GRAFT	165	60	170
23	38/F	LEFT	0	0	0	GRAFT	165	60	170
24	47/F	RIGHT	0	0	0	GRAFT	165	60	170

3.1 X-ray

24 patients had complete reduction, 6 patients had subluxation <25% immediate postoperative.

18 patients had complete reduction at last follow-up and 6 patients had >25% subluxation.

3.2 Complications

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

4. DISCUSSION

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 coracoacromial ligament to the outer clavicle as popularized by Weaver and Dunn [11-12].

Coracoclavicular screw fixation as described by Bosworth.

coracoclavicular ligament reconstruction and has been associated with hardware failure and osteolysis of the clavicle [13-14]. Intraarticular acromioclavicular fixation using pins or K-wires can lead to infection or migration and necessitate removal [13-14].

CONSENT

As per international standard or university standard, patients' written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

5. CONCLUSION

In our study 30 patients underwent AC joint reconstruction with autogenous semitendinosus graft, 15 patients (62.50%) with grade III, 9 patients (37.5%) with grade V AC joint

dislocation classified according to Rockwood's classification, 17 patient (70.83%) were chronic patients, 7 patients (29.1%) were acute. The mean follow-up period was 6.8 months (range 11-6 months), 18 patients (68.8%) had excellent outcome according to constant score, 4 patients (16.6%) had good outcome, one patient (4.1%) had fair outcome and one patient (4.1%) had poor outcome, this patient did not follow postoperative rehabilitation program the mean constant score was 89 ± 10.1 (range, 100- 63), radio- graphs 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. The study concludes by saying that the result of coracoclavicular reconstruction using semitendinosus graft been promising, safe and feasible surgical technique to treat acute and chronic acromioclavicular joint dislocation than the double loop suture repair.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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