

Acromioclavicular joint reconstruction using semitendinosus graft for acromioclavicular joint instability– a retrospective study

¹Dr. V. Nageswara Rao, DNB, Professor and HOD, Department of Orthopaedics, GSL Medical College, Rajahmundry, India.

²Dr. Kasturi Sai Abhishek Datta, Final year post graduate , MS Orthopaedics, GSL Medical college, Rajahmundry , India.

³Dr. Jetty Tejaswari, Assistant Professor, Department of Orthopaedics, GSL medical college, Rajahmundry, India.

Corresponding Author: Dr. V. Nageswara Rao, DNB, Professor and HOD, Department of Orthopaedics, GSL Medical College, Rajahmundry, India.

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Abstract

Introduction: AC joint injuries are more seen in second decade of life .Nine to ten percent of acute traumatic shoulder girdle injuries are AC joint dislocations. Young males get AC joint injuries most frequently when there is a direct or indirect impact at the acromion. ^[1]The coracoclavicular (CC) ligaments provide vertical stability for the AC joint, whereas the AC ligaments and capsular structures provide horizontal stability. Acromioclavicular ligaments disruption leads to Anterior or posterior displacement of the AC joint. ^[4]

Material and methods: 19 patients were included in this study (12 male and 7 female), from Jan 2021 - June 2022, with Rockwood type IV to type VI surgically treated with acromioclavicular joint reconstruction with semitendinosus graft and followed up for 1year and The

American Shoulder and Elbow Surgeons (ASES) Shoulder Score was used to estimate functional outcomes.

Results: In our study functional outcome was assessed by ASES shoulder score and followed up for 6months.ASES scoring mean value improved from 30 ± 4 to 90 ± 5 postoperatively. Out of 19 patients 18 had good functional outcome only one patient had a moderate outcome.

Conclusion: This surgical technique using a semitendinosus graft for AC joint capsular reconstruction and coracoclavicular ligament reconstruction in Grade IV - VI controls instability in Acromioclavicular joint and have good functional outcome.

Keywords: Acromioclavicular Joint Injuries, Rockwood Grade IV -VI, Semitendinosus Graft, Acromioclavicular Joint Reconstruction.

Introduction

Acromioclavicular joint injuries consist of a group of soft tissue disruptions which results in significant disability in the shoulder biomechanics. It is more common in 2nd decade of life. More common in patients playing contact sports and physically active patients.^[1] The very common type of insults at the shoulder joint among athletes is either a direct fall on an extended hand with elbow extension that driving the head of humerus superior into the acromion, causing an injury to the AC joint, or a direct force on an adducted hand that causes damage to the AC joint, first to the Acromioclavicular ligaments, then to the Coracoclavicular ligaments, and lastly to the deltoid and trapezius muscle aponeurosis, resulting in a major instability at the shoulder joint.^[11] There is a significant evolution in the treatment of Acromioclavicular joint injuries with a better and broad understanding of the AC joint structure and biomechanics^[4].

Historical perspective

Initially Hippocrates (460–377 BC) identified AC joint disruption. Later Galen (129–199 AD) had identified AC joint dislocation in him when he sustained an injury in a wrestling match and had treated it with a tight bandage couldn't sustain it for long as it was uncomfortable. Later non operative management was popularized in type I to type III AC joint dislocations using various other modalities like strapping, harnesses, traction, Braces and plaster casts. Where treatment of type III being still controversial. And surgical treatment of the AC Joint is first reported by Samuel Cooper in 1861 initial methods of surgery of AC joint is with pins

or wires with was for a temporary reduction till the injured ligaments heal. For treating immediate and old AC joint instability, weaver Dunn published his technique of distal clavicle resection and transferring the Coracoacromial ligament to the distal end of clavicle. This procedure, which was first described by Cadenat in 1917 and later popularized by Weaver and Dunn, could not be sustained for very long because the AC ligament after transfer could only sustain 25% of its original strength. Later the Bosworth screw technique introduced in 1941 as an extra-articular fixation had also problems due to rigid fixation resulting in implant failure, screw migration and clavicle fractures.^[10] Vargas published an open technique in 1942 that split the tendon of biceps, short head in half longitudinally, leaving proximal end of muscle attached to coracoid process. Distal portion of the tendon was transversely cut close to the muscle fibres and reflected through the distal clavicle proximally. Later, in the 1980s, hook plates were introduced; these had good functional results but also came with issues such hardware irritation, erosions, and chondrolysis in the AC joint.

Materials and Methods

19 patients were included in our study ranging from 20 to 50 years of age, both male (12) and female (7). Included being Type IV –VI AC joint injuries according to Rockwood classification. Excluding Patients < 20 years, Previous injuries to same shoulder, associated with clavicle fractures and rotator cuff injuries, Patient who did not give consent for surgery, Pathological AC joint dislocations.

The patients received AC joint reconstruction treatment. Following surgery, serial follow-up visits were conducted at the first, third, and sixth months. Clinical assessments were conducted using the American

Shoulder and Elbow Surgeons (ASES) Shoulder Score. The anticipated issues were identified, reported, and appropriately handled.

Surgical procedure

The patient lying supine on OT table under General anesthesia, Patient was kept in beach chair position. Scrubbing, painting and draping were done at both operative sites. A semitendinosus graft was harvested from ipsilateral lower limb and prepared. A 10 cm curving incision on the lateral quarter of the clavicle and the anterosuperior border of acromion was given over left clavicle area. Dissection was done along skin, subcutaneous tissue and muscle layers were separated and retracted. Clavicle is exposed and two drill holes were made at 2 cms and 4 cms medial to lateral end of clavicle. The prepared semitendinosus graft is looped around the coracoid process in figure of '8' manner and sent through tunnels of clavicle and humerus was raised above and later the knots were tied over the clavicle and the remaining part of the graft was extended onto the acromioclavicular joint. K wire was passed from lateral to medial through the AC joint. Wound closure done in layers, dressing applied in sterile environment. Patients were followed up postoperatively, on 3rd month and 6th month they were assessed using ASES scoring.



Fig.1, 2: Semitendinosus graft harvested and prepared.



Fig. 3: Through Roberts approach a marked curved incision made over the left clavicle



Fig. 4, 5: Ac joint exposed and 2 drill holes are made at 2 cms and 4 cms medial to lateral end of clavicle.



Fig. 6, 7, 8: Semitendinosus graft is passed through the tunnels, encircling coracoid process in a figure of 8 manner and the remaining graft is tied above and secured using suture anchor screws and remaining semitendinosus graft extended over AC joint.

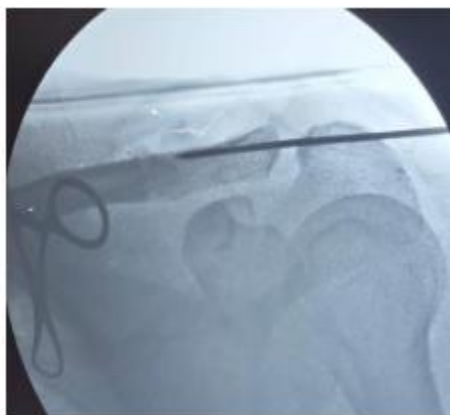


Fig. 9: Acromioclavicular joint stabilization was done with k wire.

Results

Our study's functional outcome was measured using the ASES shoulder score, and participants were tracked for six months. After surgery, the mean ASES score improved from 30 ± 4 to 90 ± 5 . Just one patient had a middling outcome out of the 19 total; the other 18 had good functional outcomes.

Class of Acromioclavicular joint dislocation	Number of Patients
IV	8
V	9
VI	2

Table 1: Study population and corresponding Rockwood classification type



Fig. 10: Intra operative



Fig.11: POD - 2



Fig.12: After 2 months of follow up



Fig. 13: Preop X-ray of AC joint disruption



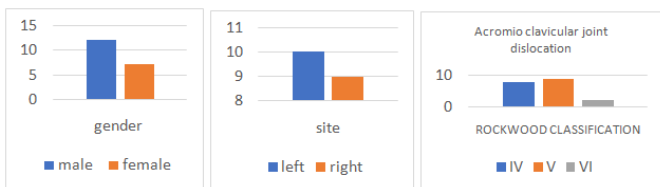
Fig. 14: After 2 weeks



Fig.15: After 6 weeks



Fig. 16: After 6 months of follow up



Graph 1, 2, 3: Showing graphical representation of the gender, side of injury and Rockwood classification type respectively.

Discussion

The axial skeleton and upper extremities are only connected via the ac joint. To ascertain individual action of various ligaments contributing for AC stability, Fukuda et al. conducted load-displacement tests with a fixed displacement following sequential ligament sectioning. The conoid ligament supplied the primary structure (62%) to resist superior translation, while the AC ligaments continued to be the primary structure (90%) to resist posterior translation.[11] Subsequent research revealed that the AC ligament and capsule play an important role in preserving horizontal stability. The

CC ligament moderates the vertical stability. The CC ligament aids in the combination of scapular rotation and glenohumeral abduction/flexion on the thorax. Glenohumeral and scapulothoracic motion must be coupled and performed simultaneously in order to achieve full overhead elevation. Because of this attachment, when the scapula rotates during scapulothoracic movement, the clavicle also rotates in unison.

	Mean	Standard deviation
Initially	30.280	3.66
3 rd month	70.120	2.01
6 th month	90.127	5.21

ASES scoring

Table 2: Showing that Initially patient had a mean value of ASES score of 30 ± 3 which had improved to 70 ± 2 after 3 months follow up and after 6 months improved to 90 ± 5 points.



Fig. 17, 18, 19: After 6 months of follow up had a significant improvement of the movements.

The coracoclavicular ligament complex's optimal acute stabilization mechanism should restore its anatomical structure. [4] Because acromioclavicular joint injuries are severely disabling injuries at the shoulder girdle, reconstructive surgery is useful for high-grade AC joint injuries. Any damage to clavicle, which acts as a connection or bridge between the shoulder and thorax, might gradually alter the function, mechanics, and posture of the shoulder. Numerous studies demonstrated

that the semitendinosus tendon, when used in acromioclavicular joint restoration, adds extra stability. Structural reconstruction of the cc and ac ligaments restoring the normal anatomy of shoulder has a good functional outcome, according to Simon Lee et al.'s review of all surgical options for shoulder ac joint reconstruction. These options include endobutton and cc fixation, Bosworth screws, hook plates, and tendon grafts.^[10]The Canadian Orthopaedic Trauma Society conducted a multicentred randomized control trial to compare the non-operative and operative treatment of acute ac joint dislocations. The study included 83 patients with acute injuries that occurred within 28 days of the initial injury, and the results indicated that hook plate fixation was not clinically superior to the non-operative group.^[3]Alexander Ladermann et al performed a cadaveric study of 3 study groups of acromioclavicular and coracoclavicular cerclages, twin tail tight rope and clavicle plate. And later several tensile stress tests applied at lab settings later found that cerclage of acromioclavicular and coracoclavicular ligaments have a higher physiological stabilization.^[4] According to Gilbert et al.'s systematic review, postoperatively American Shoulder and Elbow Surgeons (ASES) scores ranged from 93.8 to 96 in 34 studies involving 939 patients. The results indicated that the use of hook plates or k wires was linked to the high rates of failure of procedure due to loss of reduction, clavicle fractures, hardware-related problems, osteolysis & highest rates of reoperation for modified weaver-Dunn.^[9]In Tauber et al study conducted in 24 patients 12 patients who had undergone acromioclavicular joint reconstruction had a significant improvement and better outcome and had ASES scores improved from 74 ± 4 points to 96 ± 5 points.^[2] In our study post operative

ASES scoring mean value improved from 30 ± 4 to 90 ± 5 postoperatively.

Conclusion

This surgical technique using a semitendinosus graft for AC joint capsular reconstruction and coracoclavicular ligament reconstruction in Grade IV - VI controls instability in Acromioclavicular joint and have good functional outcome.

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