ORIGINAL ARTICLE https://doi.org/10.3126/njms.v6i2.42420

Functional Outcome of Reconstruction of Coracoclavicular and Acromioclavicular Ligaments in Acromioclavicular Joint Dislocation

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Received: July 4, 2021 **Accepted:** August 2, 2021 **Published:** December 31, 2021

Cite this paper:
Manandhar RR, Gautam S, Khanal KR, Khanal H. Functional outcome of reconstruction of coracoclavicular and acromioclavicular ligaments in acromioclavicular joint dislocation. *Nepal Journal of Medical Sciences*;*6*(2):39-45. https://doi.org/10.3126/njms.v6i2.42420

ABSTRACT

Introduction: Acromioclavicular joint dislocations account for approximately 12% of injuries to the shoulder girdle. Reconstruction of these dislocations is advised and various authors have described different techniques. The modern approach has emphasized anatomic reconstruction using semitendinosus autograft.

Methods: Adults with chronic acromioclavicular joint dislocation presenting to our hospital underwent reconstruction of the joint. A standard protocol of surgery and post-operative rehabilitation was followed. The functional outcome was assessed using the Constant-Murley shoulder score after six months.

Results: A total of twenty-one patients were evaluated. The functional outcome was assessed at 24 weeks using the Constant-Murley score. Nineteen patients (90.4%) had a very good outcome, one patient had a good outcome whereas one had a fair outcome.

Conclusion: The anatomic reconstruction of the acromioclavicular joint using semitendinosus graft results in very good outcomes with few complications.

Keywords: *Acromioclavicular Joint; Autograft; Shoulder*

INTRODUCTION

Acromioclavicular (AC) joint dislocations are common injuries accounting for approximately 12% of injuries to the shoulder girdle.[1] Although, seen following sports injuries, AC joint dislocations often occur after road traffic accidents and fall on the side of the body. The typical trauma mechanism is a force that depresses the shoulder girdle and the scapulohumeral complex, rather than

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the clavicle being elevated, resulting in tears of the acromioclavicular ligament and the coracoclavicular (CC) ligaments.[2]

Patients commonly present with pain accompanied by soft tissue swelling as well as a prominent lateral end of the clavicle. The pain reduces shoulder adduction and causes limitations in their daily and athletic activities. The treatment for acromioclavicular joint dislocations has not been uniform and the results also vary, based on the type of treatment.[3] Chronic instability of the acromioclavicular joint can lead to tremendous impairment of shoulder function including muscle fatigue, scapular dyskinesia, subjective sensation of heaviness of the injured upper limb, and painful horizontal adduction.[4] A basic principle in the treatment of joint injuries is to restore congruity with the hope that restoration may lessen the incidence of late arthritis.[5]

Reconstruction of these dislocations is advised and various authors have described different techniques. Both, coracoclavicular and acromioclavicular ligaments need addressal. The modern approach has been to reconstruct anatomic coracoclavicular ligament with fixation or a loop at the base of the coracoid and a biological graft passing through the clavicle either through a single drill hole or two, to mimic the course of the conoid and trapezoid ligament.[3] During the surgical treatment it is important to address the acromioclavicular ligament. The cosmetic deformity is well taken care of by the reconstruction of the coracoclavicular ligaments in the superior-inferior direction. The pain and discomfort are usually secondary to the anterior-posterior displacement of the clavicle at the acromioclavicular joint.[6] This is preventable by adding an acromioclavicular ligament reconstruction to the surgery.

The AC joint moves in a superoinferior direction, which is controlled by the coracoclavicular ligaments, and in an anteroposterior direction, which is controlled by the AC joint capsule. The superior and posterior capsules are strong restraints to abnormal mobility at the AC joint.[7] Anteroposterior movement is often overlooked and only superoinferior stability is addressed in many procedures that address coracoclavicular restoration and ignore the AC anatomy.

This study was conducted to evaluate the functional outcome of reconstruction of coracoclavicular and acromioclavicular ligaments in acromioclavicular dislocation using a semitendinosus tendon graft.

METHODS

A prospective clinical study was conducted from June 2019 to June 2021. Adults with chronic AC joint dislocation (Rockwood type III, IV, and V) presenting to our hospital OPD were included in the study.[8] Patients with associated shoulder joint pathology and opposite involvement were excluded. A total of twenty-three patients underwent reconstruction of the AC joint using semitendinosus graft. The procedure was explained in detail to the patients and written informed consent was obtained. The study was approved by the hospital's ethical research committee.

Operative technique: General anesthesia was given. The patient was placed in the beach chair position. The lateral end of the clavicle, the AC joint, the acromion, and the coracoid process was marked. A 5 cm transverse incision was made over the lateral end of the clavicle and AC joint. The deltotrapezial fascia was dissected and the clavicle exposed. The soft tissue was cleaned from the anterior, lateral, and posterior borders of the clavicle to help in graft passage and reduction of the AC joint.The coracoid was identified the base was cleared of tissue and a rent was made in the coracoacromial ligament laterally and pectoralis minor on the medial aspect. The attachments of both these structures were not detached. An indirect suture shuttle is passed under the coracoid with the help of right-angled forceps and Satinsky forceps from the medial side of the coracoid to the lateral side. The musculocutaneous nerve lies distally on

the medial edge of the coracoid and damage to it must be avoided when creating the passage under the coracoid. A loop of Prolene suture is passed via the suture shuttle. The loop of polypropylene suture was held upright and two corresponding points were marked on the clavicle for the drill holes which was approximately at the same distance as the width of the coracoid base. This individualized the size according to the breadth of the coracoid. The drill holes were initially marked with electrocautery and made using a Beath pin and a 4.5 mm cannulated drill which ensured smooth passage of the graft. Then the lateral 6 mm of the clavicle was excised using an oscillating saw. A third drill hole was made in the acromion 1 cm lateral to the AC joint. Suture loops were shuttled in each of the holes and they were used to pull the graft. Then a semitendinosus graft was harvested using tendon stripper from the ipsilateral side and prepared and passed under the coracoid. The graft was then crossed and the medial end was pulled through the lateral drill hole and vice versa. Then the first assistant was asked to push down on the lateral end of the clavicle with a periosteal elevator and the second assistant to push the elbow proximally. The graft was tied to itself, and Ultra High Weight polyethylene suture no. 2 was passed through an endobutton which was used as a cortical augmentation device to avoid a cut-through of the graft by the suture. With the endobutton pressed onto the clavicle, knots were made over the endobutton.

The longer end of the graft was passed into the drill hole in the acromion from inferior to superior, and then again tied onto itself and reinforced with Polyester no. 2 suture. Additional stability was achieved by meticulous closure of the deltotrapezial fascia.

Post-op rehabilitation protocol: The limb was placed in an arm pouch sling for 2 weeks. At 2 weeks, pendular exercises were initiated, followed by light activities of daily living at 4 weeks. At 8 weeks, active and passive ROM was encouraged, and light resistance was initiated after 3 months. Once full ROM and strength were obtained, return to athletic competition or manual labor was permitted. The functional outcome was assessed using the Constant-Murley score at 24 weeks.[9]

RESULTS

Twenty-three patients were initially recruited in our study, but two patients were lost to follow-up. Hence, a total of twenty-one patients were evaluated. The mean age of patients in our study was 28.24 ± 6.93 years. Out of 21 patients, 14 patients were male and 7 were female. In terms of the involved side 11 (52.4%), patients had sustained an injury on the right side whereas 10 (47.6%) patients had a left-sided injury. According to Rockwood classification of AC injury 03 patients had Rockwood type III injury, 10 had type IV and 8 patients had type V injury. The commonest mode of injury was found to be road traffic accidents followed by falls and sports injuries (Table 1). The mean duration from injury today of surgery was 4.19 ± 1.03 weeks. The functional outcome was assessed using the Constant-Murley score.[9] Nineteen patients had very good outcomes (Constant-Murley score >86), 1 patient had a good outcome (Constant-Murley score: 71-85) and 1 patient had a fair outcome (Constant-Murley score: 56-70). None of our patients had a poor outcome i.e. Constant-Murley score less than 56. The mean Constant-Murley score was 92.04 ± 7.71 (Table 2). One patient had a surgical site infection which resolved with oral antibiotics and local dressing.

DISCUSSION

Over 60 surgical procedures have been described for the operative treatment of acromioclavicular joint dislocations which indicates a general dissatisfaction in the existing treatment protocols.[10] Even among orthopedic surgeons inclined to operate on acromioclavicular joint dislocations, there is no unanimity on the surgical technique.[3,11] The AC joint is dynamic, as 3-dimensional

motions occur between the scapula and clavicle at the acromioclavicular joint during humeral elevation in the scapular plane, and if rigidly fixed seems to fail in time.[12] This is most likely why early techniques using metallic implants failed and migration occurred. The technique chosen in our study aimed to reconstruct the anatomy of the joint using a semitendinosus autograft.

The majority of patients in our study (66.6%) were male and young with a mean age of 28.24 ± 6.93 years which is comparable with the demographics of other studies.[13-16] The probable reason behind this is that most AC joint injuries result from high-velocity injuries and young males are more prone to such trauma by their higher involvement in outdoor activities in the Nepalese sociocultural context.

The main mode of injury in our study was road traffic accidents involving mainly two-wheelers (bicycles and motorbikes) which is a common form of transport used to commute in our country which is similar compared with previous studies from various authors. The accidents resulting in high-velocity trauma with a fall on the side led to the dislocation.[3,14,17] Using the Rockwood classification, our participants were divided into three types III, ten type IV, eight type V injuries and there were no type VI injuries, which was quite similar to the distribution of types of injuries in the other studies as well.[17.] The operative treatment of type 3 injury is controversial as mentioned by many current studies but the patients we included in our study were in high demand individuals not satisfied with conservative management.[4,16,18,19]

On assessment at 24 weeks, out of a total of 21 patients, 20 patients had a Constant-Murley score of more than 70 which means most of our patients had a very good functional outcome. One factor contributing to the very good functional outcome is the fact that most of our patients were young with an average age of 28.24 years. Millett et al used coracoacromial ligament using docking technique similar to Weaver Dunn and achieved an excellent outcome in all patients at 29 months.[20] Wang used an allogenic tendon graft to reconstruct the AC joint, which is not available in Nepal, and achieved a Constant-Murley score of 94.4.[17] With a short follow-up of 24 weeks, 100 percent of our grafts survived but we are unable to comment on the long-term graft survivorship without a long-term follow-up. However, previous studies showed that autograft gives the best graft survivorship in long term.[20-22]

In terms of complications, one of our patients (4.7%) developed surgical site infection on the fifth postoperative day which was managed with oral antibiotics and dressing. The overall infection rate is similar to reported rates which range from 0 to 9 %.[23] Postoperative clavicle fracture is a described complication after anatomic coracoclavicular (CC) ligament reconstruction. Turman et al. described 3 cases of postoperative clavicle fractures through two bone tunnels created for CC ligament reconstruction.[24] A separate study of 12 patients who underwent revision surgery for acromioclavicular dislocation using hamstring grafts also identified one patient with a clavicle fracture postoperatively.[25] The two bone tunnels created in the clavicle in these studies were of a larger diameter (6 mm) while in our study the tunnel diameter was 4.5 mm. In a cadaver model, Spiegl et al. found a significant reduction of the clavicle strength after CC ligament reconstruction using hamstring and 6 mm tunnels compared to a cortical button device and drilling 2.4 mm tunnels in the clavicle.[26] This could be the reason why no incidence of fracture of the clavicle was found in our study. With traditional techniques, hardware failure has been the major complication encountered which has been avoided in our study suggested that coracoclavicular ligament reconstruction with a single clavicular tunnel is likely to reduce the risk of iatrogenic fracture but they reported a loss of joint position in 19%.[27-29] There was no incidence of fracture of the

clavicle.

In our study, the lateral 6 mm of the clavicle was excised using an oscillating saw. Many authors have commented that late AC joint arthritis can occur in 20% of patients and it also reduces pain from chondrolysis.[30] The incidence of late joint arthritis has also been shown to be as high as 20% when a distal clavicle resection is not performed.[8] A longer follow-up would clarify the incidence in our group of patients.

CONCLUSION

Anatomic acromioclavicular joint reconstruction using semitendinosus graft resulted in very good outcomes in patients with chronic acromioclavicular joint dislocations at a medium-term follow-up of 24 weeks with few minor complications.

CONFLICT OF INTEREST

None

SOURCES OF FUNDING

None

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