## Case Report

# Functional outcome following coracoclavicular ligament reconstruction using a gracilis tendon graft for acute type III acromioclavicular dislocation: a case report

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**ABSTRACT**

The acromioclavicular joint is stabilized by two ligaments: the acromioclavicular ligaments and coracoclavicular ligaments. AC joint dislocations account for 9% to 10% of all shoulder injuries. Tossy and Allman classified acromioclavicular dislocations into three types (I, II and III). This classification was modified by Rockwood (types IV, V, and VI). Type I and II dislocations are treated conservatively. Surgery is indicated for certain Rockwood type III and for all type IV, V, and VI injuries. A 45 years old man yoga trainer presented to our emergency department with a chief complaint of pain over his left shoulder after had traffic accident 3 hours prior to admission. Physical examination revealed left lateral clavicular end prominent and tenderness over the left shoulder with limited range of motion due to pain. A Zanca view X-Ray of left shoulder was performed and revealed dislocation of acromioclavicular joint. The patient was diagnosed with suspect Left AC joint disruption grade III. We performed coracoclavicular ligament reconstruction using a gracilis tendon graft 2 days after the accident. Before the surgery, constant score of the patient left shoulder was 25 (Fair). The constant score measured was 63 after 10 month follow up. Coracoclavicular ligament reconstruction with an autogenous gracilis tendon graft was feasible and safe in physically active patients with acute type-III acromioclavicular joint dislocation.

**Keywords:** Acromioclavicular (AC) joint, Constant score, Gracilis tendon

## INTRODUCTION

The acromioclavicular joint is stabilized by two ligaments: the acromioclavicular ligaments control horizontal stability, and coracoclavicular ligaments provide vertical stability.[1] Acromioclavicular (AC) joint dislocations account for about 9% to 10% of all shoulder injuries, are more common in men (male-to-female ratio, 8.5:1), and are most commonly sports related.[2]

For younger, more active patients with type-III acromioclavicular dislocation, surgical treatment is recommended.[1,3,4] Commonly used methods include the Weaver Dunn procedure and the modified Bosworth technique using devices such as pins, 6 screws, or plates.[1,5] These interventions achieve satisfactory Constant scores of 91 to 98 and redislocation rates of 9 to 50%.[1,6–8] However, such methods have several disadvantages, namely graft infection, foreign body reactions, and the need for implant removal.[1,7]

In 1960s, Tossy and Allman classified acromioclavicular dislocations into three types (I, II and III).[1] This classification was modified in 1984 by Rockwood with

addition of types IV, V, and VI. The spectrum of injuries can range from simple sprains with minimal sequelae to severe dislocations with fascial tears, AC joint or coracoclavicular (CC) ligament ruptures, resulting in major and debilitating shoulder dysfunction.[9] Type I and II dislocations are treated conservatively.[10] Surgery is indicated for certain Rockwood type III and for all type IV, V, and VI injuries.[2] For younger, more active patients with type III acromioclavicular dislocation, surgical treatment is recommended. Commonly used methods include the Weaver Dunn procedure and modified Bosworth technique using devices such us pins, screws, or Plates. These interventions achieve satisfactory Constant scores of 91 to 98, and redislocation rates of 9 to 50%. However, such methods have several disadvantages, namely graft infection, foreign body reactions, and the need for implant removal.[11]

Coracoclavicular ligament reconstruction with an autogenous gracilis tendon entails no implant removal and no foreign body reaction; donor site morbidity is the only risk.

## CASE REPORT

A 45 years old man yoga trainer presented to our emergency department with a chief complaint of pain over his left shoulder after had traffic accident 3 hours prior to admission. Physical examination revealed left lateral clavicular end prominent and tenderness over the left shoulder with limited range of motion due to pain (Figure 1). A Zanca view x-ray of left shoulder was performed and revealed dislocation of acromioclavicular joint (Figure 3). The patient was diagnosed with suspect Left AC joint disruption grade III. Before the surgery, constant score of the patient was 25 (Fair). We performed coracoclavicular ligament reconstruction using a gracilis tendon graft 2 days after the accident.



**Figure 1: The clavicle may be prominent enough to tent the skin.**

The procedure is performed in the beach-chair position with the hip flexed to 60 to 70 degrees and the patient positioned far lateral on the bed to allow the arm to fall into c:xtc:nsion. This facilita1es exposure and mobilization of the shoulder for scapula reduction to the clavicle. A small towel bump is placed along the medial boarder of the scapula to prevent protraction of the scapula. A gently curved incision is made over the clavicle approximately 3.5 em medial to the AC joint, along Langer lines, starting posterior to the clavicle, crossing just medial to the tip of the coracoid process, and extending inferior enough to ensure visualization of the coracoid for graft passage (Figure 4).
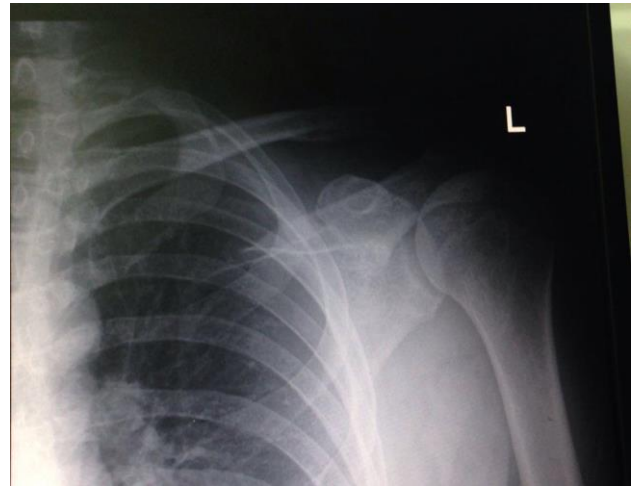


**Figure 2: X-ray left shoulder Ap view.**
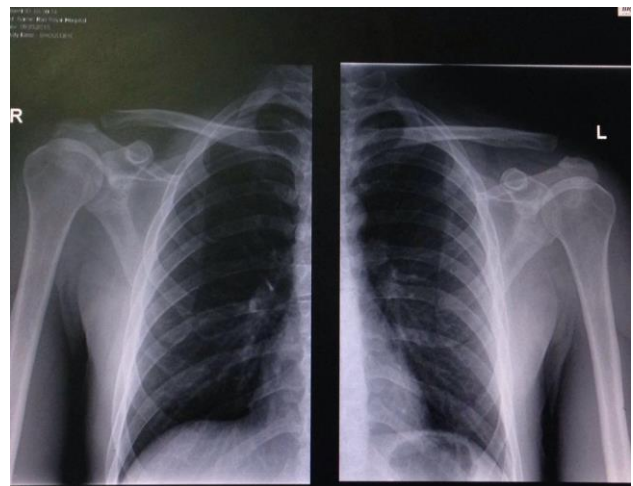


**Figure 3: Zanca view right and left shoulder.**

This incision is medial to the approach typically used for the Weaver-Dunn reconstruction. Needle tip electrocautery is used to obtain hemostasis and carry the dissection down to the deltotrapezial fascia. Generous skin flaps are raised directly above the fascia to improve visualization. The deltotrapezial fascia is then elevated off of the clavicle as full-thickness flaps. The fascia is incised in line with the na1mal demareation between the trapezius insertion to the postcri or aspect of the clavicle and the deltoid origin on the anterior clavicle. Dissection

of the fascia should extend far enough medially to expose the conoid ligament insertion, approximately 46.3mm±mm from the distal end of the clavicle of the region. The distal end of the clavicle is exposed to allow for reduction and preservation of any AC capsule/ligaments if possible. The AC joint reduction is performed by elevating the scapulohumeral complex to the clavicle by supporting the elbow and free scapula.
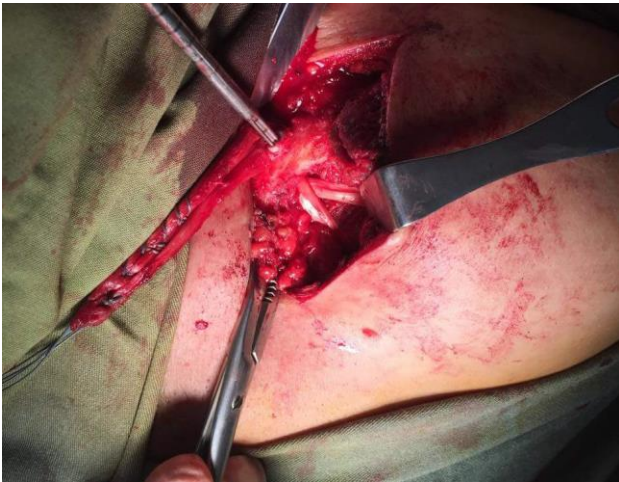


**Figure 4: Durante operation.**



**Figure 5. Post-operative zanca view right and left shoulder.**

Placement of clavicle bone tunnels for graft reconstruction of the CC ligaments is designed to reproduce and mimic their anatomic positions in relation to the distal clavicle. Smooth guide pins for the 5.0mm cannulated reamer are placed at the anatomic location corresponding to the conoid and trapezoid ligaments with a blunt retractor inferior to the clavicle for protection. Guide pin placement for the conoid ligament tunnel is placed 45mm medial to the distal clavicle and posterior to the midline of the clavicle in the coronal plane. A second pin is placed lateral to the conoid pin by 20 to 25mm and just anterior to the clavicle midline again in the coronal plane. For tunnel preparation, power reaming is used to create the tunnel. The goal is to make the tunnel as small as possible and, therefore, graft passage should be somewhat difficult. Interference fixation is obtained with bioabsorbable screws. Gracillis autograft is used in this case. The graft is prepared with a high-strength nonabsorbable suture whipstiched in both ends of the grafts. These sutures are then pulled tightly to help tubularize the flat end of the tendon while compressing the looped end, so that the tendon is of uniform diameter after preparation. The graft is passed beneath the coracoid, from medial to lateral under direct visualization, to minimize the risk of injury to the underlying neurovascular structures. The limbs of the graft are crossed in the figure-of-eight fashion before being shuttled through the bone tunnels from the inferior-to-superior direction. The graft is then cyclically loaded by pulling up on both ends in order to remove any slack and seesawed back and forth to allow for easy passage. The graft is arranged so that a shorter limb of approximately 2cm exits the conoid tunnel. The remaining length of the graft exits the trapezoid tunnel. This longer limb will be used later to reinforce the AC joint and recreate the superior and anterior AC ligaments.

Reduction of the AC joint is accomplished by elevating the scapulohumeral complex up to the clavicle by having an assistant push on the elbow. While an assistant maintains the reduction, the grafts are secured with interference screws. The remnants of the AC joint capsule/ligaments are identified and repaired with figure-of-eight stitches using absorbable suture. The deltotrapezial fascia are closed tightly with interrupted, high-strength, nonabsorbable sutures. The attachments of the anterior deltoid fascia and the trapezius fascia are brought together with inverted interrupted stitches so that the knots are tied on the inferior side of the flap.

A post-operative plain X-ray was taken to confirmed the position of the screw and the reduction (Figure 5). After the operation, a temporary arm sling was used for one to 2 weeks until pain subsided. Under the supervision of a physiotherapist and the operating surgeon, early active and passive full-range shoulder mobilisation as tolerated was started after one week. Strengthening exercises were started 8 weeks later. After 10 month shoulder function was assessed by the constant score; hindrance in daily activities, range of movement, and strength were scored (1-100, with 100 being highest) and reduction (using radiographs of acromioclavicular joints). The constant score measured was 63 after 10 month follow up.

## DISCUSSION

Injuries to the acromioclavicular (AC) joint are common, representing about 9% of all shoulder injuries. They are the third most common injury seen in college hockey players and account for 41% of all shoulder injuries seen in elite college football players.[12] However, despite the high frequency of AC separations, there continues to be substantial controversy about their management. Type III

injuries are the most controversial because there has long been debate over whether they should be treated operatively or nonoperatively. Furthermore, numerous surgical techniques have been described for the surgical management of AC separations, and controversy remains over which method is the most effective.[12] Although there are more than 60 procedures described for surgical treatment of acromioclavicular joint dislocations, there is still no gold standard. When overall surgical options are considered, there are two groups of surgical treatment: primary repair or reconstruction of the coracoclavicular ligament.[1]

Acromioclavicular joint fixation has been made with the use of a screw, K-wire, or plate. However, these techniques are associated with the development of infection, acromioclavicular joint arthritis, implant failure or migration, resulting in high rates of failure.[1] Another technique is the dynamic muscle transfer; however, static stability cannot be assured in dynamic muscle transfers, and it is associated with risks for nonunion and nerve damage. Coracoclavicular stabilization can also be performed with the use of screws, synthetic material, or cerclage wires. The stability of anatomical acromioclavicular joint reconstructions with the use of graft implantation is highly associated with the graft used. Coracoclavicular stabilization with a lag screw was described by Bosworth in 1940s. No repair or reconstruction of the ligament were described in the original technique. In 1990s, Rockwood and Young recommended repair of the ligament in acute cases, and reconstruction of the ligament in chronic cases, along with the use of a Bosworth screw. Arthroscopy-aided fixation with a coracoclavicular screw described by Rolla et al. In 2004 improved this treatment method one step further, minimizing surgical trauma.[1]

The indication for surgery and choice of technique remain controversial for type-III acromioclavicular dislocation. Early surgical repair is recommended for patients with a prominent distal clavicle or persons frequently performing heavy lifting or overhead work. Commonly used surgical techniques include the Weaver Dunn procedure and the modified Bosworth technique, which entail various fixation devices. These techniques are reported to produce good functional Constant scores, but entail complications, including: foreign body reactions from absorbable polydioxanone suture augmentation, and Dacron grafts, as well as screw loosening. Coracoclavicular ligament reconstruction using an autogenous gracilis tendon requires no implant removal and entails no foreign body reaction. Both semitendinosus and gracilis tendon grafts confer superior initial biomechanical properties compared to coracoacromial ligament transfer. The good initial strength enables early active and passive shoulder mobilization exercises.[11,12]

A similar technique was first reported in 2001 in a 34-year-old-woman. It entailed salvaging a failed acromioclavicular reconstruction with coracoclavicular ligament reconstruction using a loop of autogenous semitendinosus tendon from the ipsilateral knee.[11] The failed reconstruction was complicated with anterolateral shoulder pain interfering with daily activities. Magnetic resonance imaging showed hypertrophic scar around the Gore-Tex graft and osteolysis in the clavicular region of the synthetic device. The Gore-Tex graft and associated fibrous tissue were removed and augmentation was performed with an autogenous semitendinosus graft. Pain-free, full range of movement was reported 24 months later.[11]

## CONCLUSION

Coracoclavicular ligament reconstruction with an autogenous gracilis tendon graft was feasible and safe in physically active patients with acute type-III acromioclavicular joint dislocation.

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