Abstract:
Acromioclavicular joint dislocation has been one of the difficult conditions to be treated operatively. No other joint in the human body is treated in many ways as the Acromioclavicular joint. Eight patients with isolated Type 3 Rockwood's Acromioclavicular joint dislocation were selected and managed with either modified Phemister technique or Bosworth technique. The aim of the study is to analyse and compare the functional outcome of the shoulder in patients with Type 3 Rockwood's Acromioclavicular joint dislocation managed by Modified Phemister technique or Bosworth technique using UCLA score.

Keyword: Acromioclavicular joint dislocation, Rockwood's classification, Conoid and Trapezoid ligaments, Modified Phemister technique, Bosworth technique, UCLA score.

INTRODUCTION
The most common mechanism of injury is a direct force applied to the superior aspect of the acromion, usually from a fall with the arm in an adducted position. This impact drives the acromion inferiorly, spraining the intra-articular acromioclavicular ligaments. If the force is great enough, the extra-articular coracoclavicular ligament may also be damaged. Less commonly, an indirect force may be transmitted up the arm as a result of a fall on an outstretched hand. The force continues through the humeral head to the acromial process, displacing it superiorly and stressing the AC ligaments. Injuries to the acromioclavicular joint (ACJ) which result in disruption of the normal joint account for approximately 3-5% of trauma to the shoulder girdle. Acromioclavicular joint injuries are seen especially in competitive athletes, such as rugby or hockey players, and occur most frequently in the second decade of life. Males are more commonly affected than
females, with a male-to-female ratio of approximately 5:1. Rockwood type III injuries are primarily managed conservatively, but can be treated operatively dependent on the clinical severity of the affected individual. There are six types of Acromioclavicular joint dislocation according to Rockwood's classification. Among which, type three - type six - rarest. Treatment for acute type III acromioclavicular (AC) injuries remains controversial despite randomized trials that indicate success with nonoperative treatment in most cases. The operative methods of stabilization are varied with over 60 surgical techniques currently described, the choices of which include ACJ stabilization with Kirschner wires, screws, hook plates, autograft or allograft materials to reduce the ACJ, as well as artificial materials such as Dacron, braided polyester, Chronic acromioclavicular separation: coracoclavicular ligament reconstruction using braided polyester prosthetic ligament or polydioxanonesulphate(PDS) either with or without the use of a coracoacromial ligament transfer to reconstruct the ruptured coracoclavicular ligaments, coracoacromial ligament to reconstruct the coracoclavicular ligaments.

**MATERIALS AND METHODS**

Eight patients with isolated Type 3 Rockwood's Acromioclavicular joint dislocation were included in the study. The Acromioclavicular joint reduced and fixation done with either modified Phemister technique or Bosworth technique. All the patients were males. The age of the patients averaged from 32 years to 63 years. All the patients were initially treated with a Jones' strapping with a cuff and collar for temporary immobilisation and pain relief. Timing of surgery was on an average of three days from the day of injury. No patient had open injury or associated neurovascular injury. All the eight cases were taken up for elective surgery. Five of the cases were managed with Two criss cross wires, Three patients with 6.5mm cancellous screws with a washer.

In order to analyse the advantages, disadvantages, complications and functional outcome of the Modified Phemister technique and the Bosworth technique in the management of Type 3 Acromioclavicular joint dislocation, we have chosen both the techniques for the management. The Acromioclavicular joint dislocation was treated with any one of the two methods.

**SURGICAL TECHNIQUE**

Under general anesthesia and patient in supine position the AC joint is exposed through an Anterior curvilinear incision. The AC joint is examined for any rotated or locked articular disc inside the joint. Any offending disc removed. The AC joint was reduced and stabilised with one of the following: 1. Two criss cross 'K' wires inserted about two cm apart through the lateral border of the acromion, as entering through the centre of the articular facet of the acromion. In some cases the 'K' wires were passed in a retrograde manner, from the articular surface of the acromion out through the skin. The dislocation reduced. The 'K' wires advanced across the joint into the clavicle for about two to three cm. The position of the wires and accuracy of reduction checked by AP, Lat X rays. If both were satisfactory, the wires were bent and cut. 2. A 6.5mm cancellous screw passing from the superior aspect of the lateral end of clavicle fixing the base of the coracoid process, with a washer. Ligamentous repair of the coraco-clavicular ligaments done.
In Modified Phemister technique, after exposing the AC joint the torn ends of the CC ligaments were identified. A mattress suture was applied at both the ends with an absorbable suture material. After stabilising the reduced AC joint with criss cross wires, the AC joint capsule and the AC ligaments repaired. At the end the applied mattress sutures in the CC ligaments were tied up to maintain the reduction of the joint. With Bosworth technique, mattress sutures were applied to the torn ends of the CC ligaments. The AC joint was cleared off all the interposing structures. Then the cancellous screw was advanced from the superior aspect of the lateral end of the clavicle to the base of the coracoid stabilising the AC joint. The previously applied mattress sutures in the CC ligaments were tied up finally. In one case we have additionally tied the CC ligaments to the cancellous screw. 

DISCUSSION RELEVANT ANATOMY - The acromioclavicular (AC) joint is a diarthrodial articulation with an interposed fibrocartilaginous meniscal disk that links the hyaline cartilage articular surfaces of the acromial process and the clavicle. The joint is stabilized by a combination of dynamic muscular and static ligamentous structures, which allow a normal anatomic range of motion. Because of the transverse orientation of the articulation, direct downward forces may result in shear stresses that cause disruption of these stabilizing structures and create displacement beyond the normal limits. This is evidenced by abnormal positioning of the clavicle relative to the acromion, usually in the superior direction. The acromioclavicular (AC) joint capsule is strengthened by the anterior and posterior AC ligaments. These ligaments are intracapsular and provide stability in the anterior and posterior directions. The trapezoid and conoid components of the coracoclavicular (CC) ligament add vertical stability. They attach to the coracoid process and the inferior surface of the distal clavicle. The capsular AC ligaments and the extracapsular coracoclavicular (CC) ligament are the primary static stabilizers of the AC joint. The anterior and posterior AC ligaments are predominantly responsible for maintaining stability in the anteroposterior (AP) plane. The 2 components of the CC ligament, the trapezoid and conoid ligaments, provide restraint against compression and superior-inferior translation, respectively. The fibers of the trapezius and the deltoid muscles provide additional stability. 

ROCKWOOD’S CLASSIFICATION
Type 1 Sprain of the AC ligament. No abnormality in X ray Type 2 AC ligament tear with joint disruption and sprained CC ligaments. Distal clavicle is slightly superior to acromion and AC joint opening. Type 3 AC and CC ligaments torn with AC joint dislocation. The CC widening is evident, distal clavicle superior to the medial border of the acromion; stress views reveal a widened CC interspace 25% to 100% greater than the normal side. Type 4 Type 3 with the distal clavicle displaced posteriorly into or through the Trapezius. Posterior displacement of the distal clavicle. Type 5 Type 3 with the distal clavicle grossly and severely displaced superiorly. CC interspace to be 100% to 300% greater than the normal side. Type 6 AC joint dislocated, with the clavicle displaced inferior to the acromion or the coracoid; the CC interspace is decreased when compared to the normal. Two types of inferior dislocation: Subacromial or Subcoracoid. The severity of an AC separation is dependent upon the degree of ligamentous injury. Type III through type VI separations are characterized by disruptions of both the CC and
AC ligaments; therefore, they constitute unstable injuries that must be accounted for or require surgical reduction and stabilization of the acromioclavicular joint, the clavicular ligament, and the coracoclavicular ligament. In Type III injuries there is additional rupture of the coracoclavicular ligament and minor disruption of the distal clavicular attachment of the deltoid. Here the ACJ is dislocated, with the ruptured coracoclavicular ligaments, but distal clavicle displaced superiorly relative to the acromion, thought to be secondary to depression through the lateral border of the acromion.

MODIFIED PHEMISTER TECHNIQUE

Expose the acromioclavicular joint, the lateral end of the clavicle, and the coracoid through an anterior curved incision. Examine the acromioclavicular joint. Remove the disc or any other offending structure. Place mattress sutures in the ruptured coracoclavicular ligaments, but do not tie them. Insert two Kirschner wires to the acromion by at least the height of the size of a guidewire about 2 cm apart ACJ, thought to be secondary to depression through the lateral border of the acromion.

BOSWORTH TECHNIQUE

This operation was designed temporarily to maintain reduction of a complete acromioclavicular separation by the insertion of a single vitallium screw, under local anesthesia, through the outer portion of the clavicle into, and through, the underlying coracoid process of the scapula. The Screw and Its Implantation. Only a screw of an electrolytically inert material, having a wide-flanged thread of minimal pitch and a broad, flat head, should be used. In most patients the one and a half-inch screw will grip the
under surface of the coracoid adequately with the acromioclavicular dislocation reduced. Occasionally, when the distance between coracoid and overlying clavicle, following reduction, is greater than normal (one-half inch) or the individual has very large bones, it may be necessary to employ the one and five-eighths or the one and three-quarter-inch screw. Complete reduction must be secured before the hole in the clavicle is drilled and the screw inserted so that proper direction of the screw is assured. A tiny hole may be made with an awl in the upper surface of the coracoid to start the screw but the coracoid must not be drilled and the screw must penetrate both cortices of that bone.
FOLLOW UP
Temporary immobilisation of the involved shoulder for initial two weeks with a shoulder immobiliser or arm sling to reduce post operative pain and swelling. The pin site dressing done periodically and the pin sites were examined for any loosening and infection. Active, gentle shoulder mobilisation exercises started by the end of two weeks. All the patients were followed up every two weeks. The patients were followed up for any migration of the K wires, pullout of the screws, residual subluxation, persistent pain and prominence of the lateral end of the clavicle. One of our patients after K wire fixation had 'K' wire loosening and another had a superficial infection at the surgical site. The loosened K wires removed, oral antibiotics were given to treat the infection. No patient had persistent pain, any screw pullout, migration of the K wires, residual subluxation. 'K' wires were removed under local anesthesia after eight weeks, while the cancellous screws were removed under general anesthesia at the end of 12 weeks. After K wire and Screw removal there was no subluxation of the Acromioclavicular joint. Almost all the patients had near normal shoulder movements.

Comprises of five components. Got a Total score of 35 points a)Pain - 10 points b) Function - 10 points c)Range of forward flexion - 5 points d)Strength of forward flexion - 5 points e)Patient satisfaction - 5 points Excellent and good > 27 points Fair and poor < 27 points With the available short case series, we have analysed the patients for all the five components under the UCLA score separately.

Patients under the Bosworth technique group had a terminal restriction of shoulder abduction and more shoulder stiffness. Range of forward flexion-Terminal restriction of forward flexion was noted in the patients treated with Bosworth technique. Patients under the modified Phehister technique group had excellent range of forward flexion of the operated shoulder. Strength of forward flexion-Remained nearly same in the patients under both the groups.

Patient satisfaction-Both the group of patients had good satisfaction with the functional outcome.

CASE 1- MODIFIED PHEMISTER TECHNIQUE
CASE 2 - BOSWORTH TECHNIQUE
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In our study with modified Phemister technique, two patients with AC joint had difficult closed reduction due to the offending articular disc, in which the articular discs were excised. The reduction could be achieved easily in the other three cases. With Bosworth technique, there was difficulty in fixing the the coracoid process in one case. Conservative treatment by a strapping applied encircling the clavicle above and below can lead on to shoulder stiffness and may interfere with the functional outcome. The patients are restricted from their day to day activities due to the strapping. Also there is chance for failure of closed reduction of the AC joint due to interposition of the torn capsule and a damaged meniscus preventing the repositioning of the clavicle. The common sequelae after conservative management are residual subluxation of the joint, pain, weakness, limitation of motion, arthritis of the joint. Complications of conservative treatment of AC joint dislocation can be avoided by surgical management. Similar to the study conducted by P.F. O'Carroll and J.M. Sheehana at St Vincent's Hospital, Dublin, UK ,we had infrequent complications and the cosmetic acceptance was satisfactory. Our study has got proven excellent results as the study by Boardman Marsh Bosworth, M.A. (OXON.), M.D, Bronxville, Newyork which yielded satisfactory results with AC joint fixation by Bosworth technique.

**SUMMARY AND CONCLUSION**

Acromioclavicular joints dislocations can be managed either non operatively or operatively. Non operative treatment is associated with poor functional outcome, difficult closed reduction. We conclude that AC joint fixation with operative treatment gives excellent results. Modified Phemister technique and Bosworth technique have proven to be effective in the management of AC joint dislocation in our study. Modified phemister technique had certain advantages over Bosworth technique in our study. 1.It is less expensive 2.No need for a second surgery 3.No erosion or fracture of the lateral end of clavicle

**REFERENCES**


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