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Functional Outcome of Acute Acromioclavicular Dislocation Managed By Transarticular Fixation by Hook Plate

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ABSTRACT: This study of functional outcome of acute acromioclavicular dislocation managed by transarticular fixation by hook plate done in patients with acromioclaviculardisruprions of rockwood and young type three and above was to done to verify the credibility and advantages of surgical intervention with hook plate

I. INTRODUCTION

1.Injury to acromioclavicular joint represent a spectrum of soft tissue disruptions that can result in mild,transient pain ,significant displacement,chronic pain and changes in shoulder biomechanics results in longterm disability

Most commonly occurs in male of age less than 30 yrs and associated with contact sports or athletic activity in which direct blow to lateral aspect of the shoulder occurs

Presently this injuries are treated surgically by hook plate

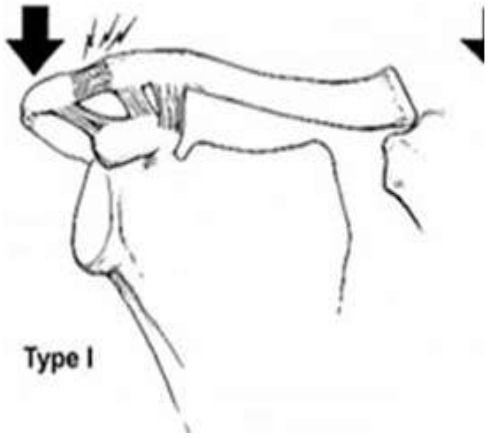
AC joint disruption is often associated with coracoclavicular ligaments disruption and unstable

Classification of Acromioclavicular Joint Dislocation

Rockwood Classification[36]

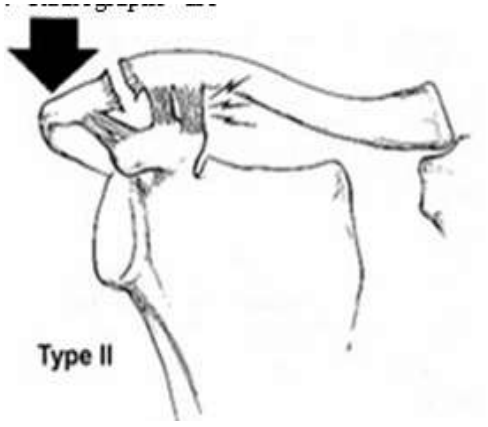
Type I

- Sprain of the acromioclavicular ligament.
- AC joint tenderness, pain present with minimal arm abduction. Radiographs are normal



Type II

- Acromioclavicular joint disruption causes ligament tears and sprained coracoclavicular ligaments. The distal clavicle is slightly superior to acromion and mobile to palpation, tenderness found in the coracoclavicularspace.
- Radiographs demonstrate a slight elevation of the distal end of the clavicle andAcromio-clavicular joint widening. Stress films show the sprain of coracoclavicularligaments and integrity ismaintained.



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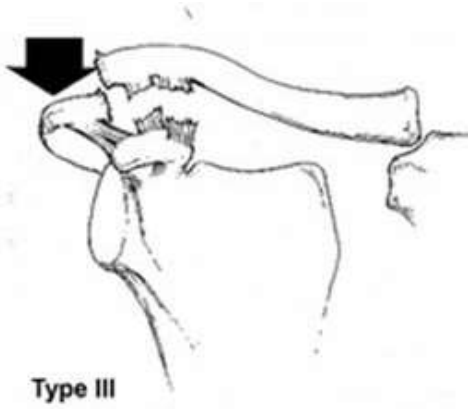
Type III :

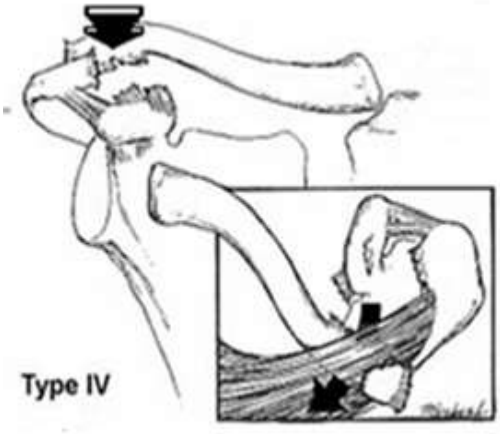
- Acromion-clavicularandcoracoclavicular ligaments are torn; deltoid and trapezius muscles usually detached from the distalclavicle.
- The upper extremity and distal fragment are depressed, and the distal end of the proximal fragment may tent the skin.[36] The Acromioclavicular joint is tender, coracoclavicular widening is evident.
- Radiographs demonstrate the distal clavicle superior to the medial border of the acromion; stress views reveal a widened coracoclavicular interspace 25% to 100% higher than the normal side.



Type IV:

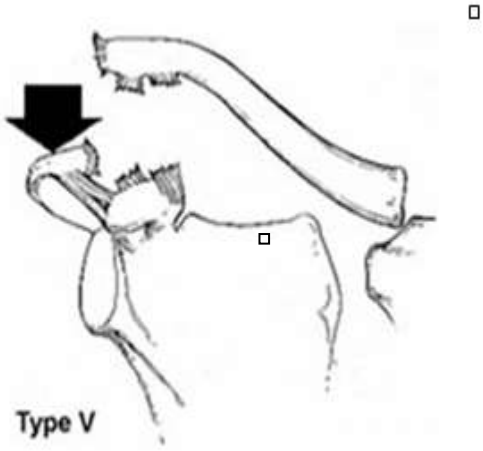
- Type III andthe distal clavicle displaced posteriorly into or through thetrapezius.
- Clinically, more pain exists than in type III; the distal clavicle is displaced posteriorly away from the clavicle

An axillary radiograph or computed tomography demonstrates posterior displacement of the distal clavicle.



Type V

- Type III with the distal clavicle grossly and severely displacedsuperiorly.
- This type is typically associated with the tenting of the skin.
- Radiographs demonstrate the coracoclavicular interspace to be 100% to 300% greater than the normal side.



Type VI

- Acromioclavicular joint dislocated, with the clavicle displaced inferior to the acromion or the coracoid; the coracoclavicular interspace is decreased compared withnormal.
- The deltoid and trapezius muscles are detached from the distalclavicle.
- The mechanism of injury is usually a severe direct force onto the superior surface of the distal clavicle, with the abduction of the arm and scapularetraction.
- Clinically, the shoulder has a flat appearancewith

a prominent acromion; associated clavicle and upper rib fractures and brachial plexus injuries are due to high energy trauma.

- Radiographs demonstrate one of two types of inferior dislocation: subacromial subcoracoid.[36]

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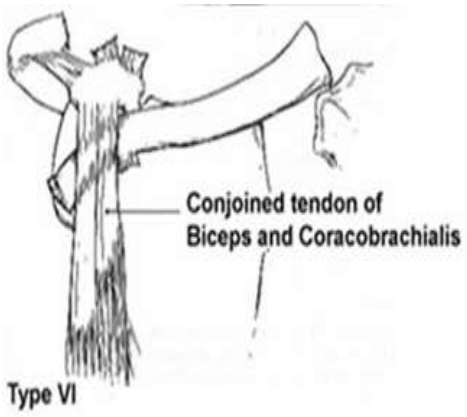

AIMS ANDOBJECTIVES:

The objective of this study is to analyze:

1. The functional outcome of hook plate fixation for AC joint disruptions
2. To evaluate the need for repair of the acromioclavicular capsule, ligaments, and coracoclavicular ligaments.
3. To know the reduction and stability of the ACjoint.
4. To assess the pros and cons related to thisimplant.
5. To know the need and indication for implantremoval.
6. To evaluate the time taken to reach pre-injury functionalstatus.

II. MATERIALS AND METHODS

This is a prospective analytical study of functional outcome of acute acromioclavicular dislocation managed by trans-articular fixation by hook plate during the period from September 2018 to march 2020 at Narayana general hospital attached to Narayana medical college Nellore

For the Case selection criteria, all patients, during this period, diagnosed with acute ,acromioclavicular joint dislocation, will be screened using the inclusion and exclusion criteria. Informed consent will be taken for all patients that fit the inclusion criteria, and all patients willing to undergo the trial will be included.

Study method - All the patients will be followed up at 6 weeks,3months,6months and 1 year postoperatively and will be studied as per the UCLA score and Constant score.

The evaluation of difference of Constant score and UCLA score and the progress was evaluated at 1st follow up, and each follows up was done using a **paired t-test.** P-Value of < 0.05 was considered to be of significance. The Constant and UCLA score was not possible preoperatively as only acute acromioclavicular injuries only. The effect of the type of dislocation and body mass index on the final functional outcome was also studied using the ANOVA test.

HOOK PLATE

in 1970, hook plate usedby Baser for AC joint dislocation, would be the earliest description. Wolter D published in the journal of Orthopedic operative and Traumatology in the year 1989,followedbyRamadazade, Keifer (Sterli hook plate) Dreithaler in 2011,hook plate by Best MedicalCompany, Tokyo

The AO (synthes) hook plate is a side specific, pre-contoured plate (32). It comes in 2 variations-

1. "Clavicle hook plate" in two types of 15mm and 18mm on 6 or 8 holes plate made of commercially pure titanium or 316L stainless steel. The posterior offset of the hook is to avoid the AC joint entry and is seated behind the AC joint. where the hook entered the AC joint. All the studiesapproached the AC joint through a shoulder strap incision (along the langer lines) and consisted of repair of theligaments.
2. "LCP clavicle hook plate"- side specific, comes as 4, 5, 6, 7 (combiholes) holes, has 3 hook depths of 12mm, 15mm, 18mm and comes in stainless steel and titanium and priced Rs22,000/-.

Several articles support the use of a hook plate

Inclusion criteria:

1)Age between 20 to 60 years
2)closed fractures
3)Fresh fractures less than 4 weeks old
4)Allacromioclavicular joint disruptions of (Rockwood and Young type III-VI) either acute or sub-acutetypes

Exclusion criteria:

1)Patients are not fit for surgery and anesthesia
2)Open fracture
3)Associated neurovascular injuries
4)Patients with fracture lateral end of the clavicle.
5)Patients with chronic acromioclaviculardislocation.
6)Patients with Type 1 & Type 2 of acromioclavicular dislocation as per Rockwood classification.
7)Patients with pain-free AC joint dislocation and Full ROM after the dislocation

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TREATMENT PROTOCOL:

During the period between September 2018 and march 2020, all patients diagnosed with acute acromioclavicular joint dislocation seen were screened using the inclusion and exclusion criteria. Informed consent taken for all patients that fit the inclusion criteria, and all patients willing to undergo the trial were included.

INITIAL MANAGEMENT:

Clinical and radiological examination of all patients and primary resuscitation of all patients if required done for all patients included in the trial following which treatment instituted included

- Temporary immobilization: - universal shoulder immobilizer or sling support.
- Analgesics and other symptomatic treatment

Preoperative planning:

1) X rays of the shoulder – Antero-posterior and ZancaView
2) Stress X rays with 5kilograms of weight
3) Pre-operative routine laboratory investigations

All the patients were classified according to the Rockwood classification for Acromioclavicular joint injury.

Each patient underwent a set of investigations - Haemogram, Blood Sugar Level, Bleeding & Clotting Time, HBsAg, HIV, Blood Group, Urine – Routine & Microscopy, Chest Radiograph, and ECG. Other pre-operative and metabolic investigations for medical and anesthetic fitness were done. Patients were operated by trans-articular fixation by Hook plate.

3.5mm dynamic compression plate hook plate for AC joint disruptions and. The plate had a hook with posterior offset , as to avoid entry into the AC joint capsule and washookedbeneath the acromion and posterior to the AC joint capsule. It was made with a height of 11 or 12 mm and hook length of 10 mm

OPERATIVE PROCEDURE

the patient in a beach chair position

An incision along the superior margin of the lateral clavicle running posterior to the acromion joint given in all cases

Negligible soft tissue dissection done.The only soft tissue dissection was the cutting of the deltotrapezial fascia while the AC joint was left undissected. A needle was used to identify the AC joint and also as a guide to the entry point of hook insertion.

AC joint disruption, a 3 hole plate, 3.5mm DCP ,3.5mm cortical screws were used. Ligament repair not done in any of the cases and deltoid, trapezium fascia was resutured back at the time of closure. A drain was kept after the procedure

Physiotherapy Protocol:

First 2 weeks arm in a universal shoulder immobilizer with the movement of the elbow 3rd and 4^{th} week- Uniplanar flexion, abduction, extension, and flexion exercises of the shoulder in scapsion position. 5^{th} and 6^{th} week- Up-to 90^{0} flexion and abduction of the shoulder, i.e., Biplanar motion exercises, were given.

For the next 3 to 4 months - a full shoulder range of motion exercises was advised.

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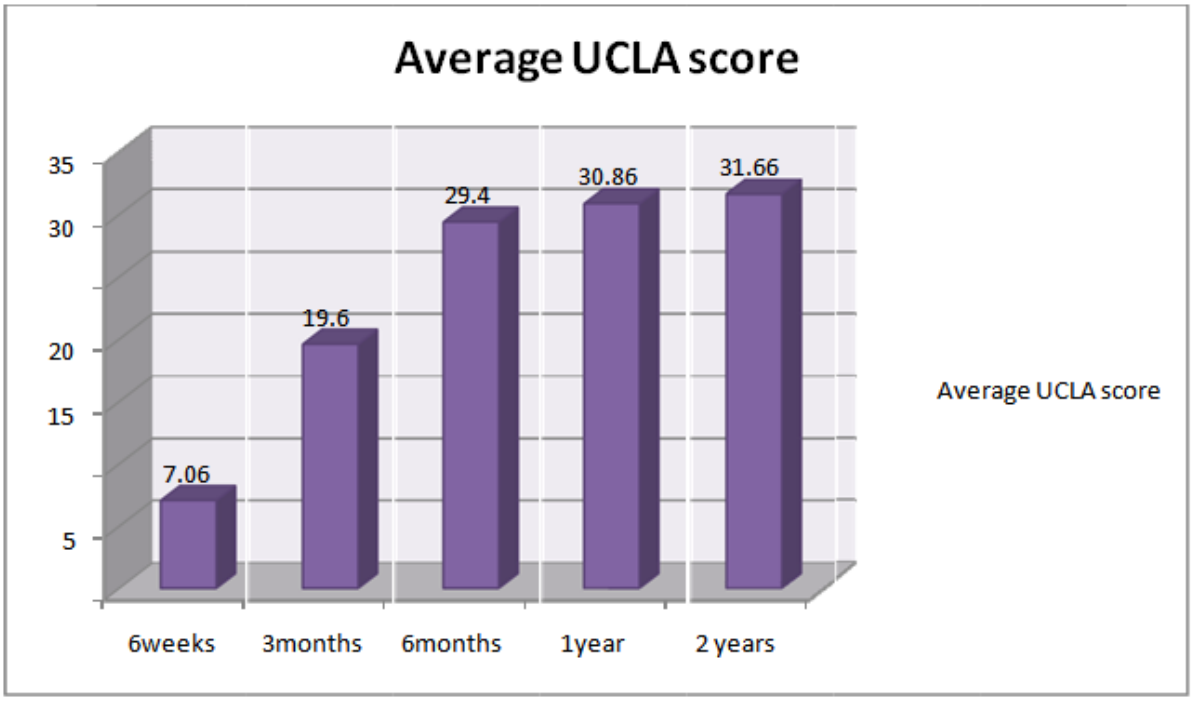
III. CONSTANT AND UCLA SCORING SYSTEM:

All patients were assessed using the Constant and UCLA scoring system[74]. Following is the table showing the average improvement of the Constant score over 1 year. The Mean constant score at 6 weeks follow up was 37.06 and it went up to 90.83 in the final follow up of 1 year .P value of 0.0069 in table 5 shows that the improvement in the constant scoring is significant at 1 year follow up compared to the first followup.Table of constant score:

Follow up	Average Constant score	Standard deviation	P value
6 weeks	37.06	1.163	-
3 months	71.8	1.082	<0.0001
6 months	89.53	2.800	<0.0001
1 year	90.93	2.939	<0.0001

Table of average UCLA score:

Follow up	Average UCLA score	Standard deviation	P value
6 weeks	7.06	0.59	-
3 months	19.6	0.9103	<0.0001
6 months	29.4	1.549	<0.0001
1 year	30.86	1.846	<0.0001



IV. CONCLUSION

The UCLA score improved significantly as seen by the graphical presentation in .The P value at follow up of 1 year shows that average improvement in the Constant score over 1 year is significant according to the paired t test.

The mean time to achieve painless full abduction was 6 months (range 5 – 8 months). The mean time reported for return to full recreational activity was 3.5 months (range 2-6 months).

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COMPARISON OF THE NORMAL AND AFFECTED ARM (FINAL FOLLOW UP)

We made a comparison of the UCLA and Constant score of the affected arm at 1 year follow up and the normal arm. Table 7 shows the mean Constant score of normal arm being 97.4 and affected arm at 1 year follow up being 90.93. Similarly the UCLA score of affected arm at 1 year follow up was 30.86 with the normal arm being 34.93.

	NORMAL ARM MEAN±SD	AFFECTED ARM MEAN±SD
AVERAGE CONSTANT	97.4±0.83	90.93±1.83
AVERAGE UCLA	34.93±0.2582	30.86±0.74

Grading the Constant Shoulder Score[74] (Difference between normal and Abnormal Side)

Poor	>30
Good	21-30
Fair	11-20
Very Good	6-10
Excellent	<11

CASE 1

–A 46 years male. Type 5 Acromioclavicular dislocation, operated with hook plate

Preoperative xray immediate postop xray

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followup at 3rd month follow up at 6th month

follow up at 1 year

RANGE OF ABDUCTION RANGE OF FLEXION

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RANGE OF INTERNAL ROTATIONRANGE OF EXTERNAL ROTATION

complications seen in our study were:

1. COMPLICATIONS SEEN IN OUR STUDY ARE:

1.Impingement

2. Osteolysis at the tip ofthehook
3. Cut outof hook
4. Rotator cuff injuries

-

V. DISCUSSION

The function of the AC joint and its ligament is involved in the suspension of the scapula and support of the weight of the upper extremity.

Once the ligaments get injured and damaged, the joint stability must be done by muscles. The deltoid and trapezius muscles are primarily involved in the acromioclavicular stabilization when the ligaments are injured

. The loss of suspension may lead to muscle fatigue, the encroachment of the acromion on the supraspinatus tendon, and neurologic symptoms due to traction on the brachial plexus

[49]The most significant disadvantages of conservative management of an acromioclavicular injury are an impaired shoulder function, pain, cosmetic deformity and effect on performance of athletes involved in upper limb activities

. All the earlier fixation methods led to an extremely rigid fixation which impaired the rotational movement between clavicle and scapula This aspect is taken care of by an implant-like clavicular hook plate which forms leverage between proximal ends of plate fixed to distal clavicle; hook penetrates the undersurface of acromion and maintains the amphiarthroticacromioclavicular articulation The functional outcome of shoulder following removal of the hook plate improved significantly during subsequent follow-ups. The Constant Score after 12 weeks post hook plate removalwas on an average of 60

hook plate in our experience is an excellent device to obtain a congruent acromioclavicular joint due to its unique biomechanical characteristics and stiffness which are most similar to a physiologic acromioclavicular articulation [25].

VI. CONCLUSION AND SUMMARY

The following points are derived from this study

1. Hook plate is a good option for treatment of AC joint disruption
2. Limited use of instrumentation for theprocedure
3. Less duration of the surgicalprocedures
4. Less incidence ofcomplications
5. Good subjective and objectiveoutcomes
6. Stability to the AC joint attained without the need for ligament repair or reconstruction.

Implant removal is advisable but the decision depends on the presenceor absence of impingement and osteolysis.

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