

**A STUDY ON FUNCTIONAL OUTCOME OF BIOLOGICAL  
RECONSTRUCTION OF ACROMIOCLAVICULAR JOINT  
DISLOCATIONS TYPE III TO VI USING SEMITENDINOSUS  
GRAFT WITH ENDOBUTTON**

**(PROSPECTIVE STUDY)**

**Dissertation submitted in partial fulfillment of the regulation for the award of**

**M.S. Degree in Orthopaedic Surgery**

**Branch II**



**THE TAMILNADU**

**Dr. M. G. R. MEDICAL UNIVERSITY**

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**MADURAI MEDICAL COLLEGE**

**MADURAI**

**CERTIFICATE**

This is to certify that the work **“A STUDY ON FUNCTIONAL OUTCOME OF BIOLOGICAL RECONSTRUCTION OF ACROMIOCLAVICULAR JOINT DISLOCATIONS TYPE III TO VI USING SEMITENDINOSUS GRAFT WITH ENDOBUTTON ( PROSPECTIVE STUDY) ”** which is being submitted for M.S. Orthopaedics, is a bonafide work of **Dr. R MUTHUSAMY**, Post Graduate Student at Department of Orthopaedics, Madurai Medical College, Madurai.

*The Dean ,*

*Madurai Medical college,*

*Madurai.*

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This is to certify that this dissertation titled “ A STUDY ON FUNCTIONAL OUTCOME OF BIOLOGICAL RECONSTRUCTION OF ACROMIOCLAVICULAR JOINT DISLOCATIONS TYPE III TO VI USING SEMITENDINOSUS GRAFT WITH ENDOBUTTON ( PROSPECTIVE STUDY) “ is a bonafide work done by **Dr.R MUTHUSAMY** postgraduate student of Madurai Medical College, Govt Rajaji Hospital.

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**Madurai.**

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## DECLARATION

I, **Dr.R MUTHUSAMY**, solemnly declare that the dissertation titled **“A STUDY ON FUNCTIONAL OUTCOME OF BIOLOGICAL RECONSTRUCTION OF ACROMIOCLAVICULAR JOINT DISLOCATIONS TYPE III TO VI USING SEMITENDINOSUS GRAFT WITH ENDOBUTTON ( PROSPECTIVE STUDY)”** has been prepared by me. This is submitted to **“The Tamil Nadu Dr. M.G.R. Medical University, Chennai**, in partial fulfillment of the regulations for the award of M S degree branch II Orthopaedics.

Place :

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Date :

Post Graduate in Orthopaedics,

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### **ANNEXURES :**

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## INTRODUCTION

Acromio clavicular joint dislocations are common in physically active young adults that too most common in persons who are participating in sports activities . incidence is more in males who are participating in contact sports like rugby , basket ball, hockey. It accounts for 9% of all shoulder injuries .

Literature says the incidence is 3-4/1,00,000 population .In(460–377BC), Hippocrates mentioned about acromioclavicular joint dislocations in his literature. Galen (129–199 AD) diagnosed his own AC dislocation received from wrestling in the Palaestra and he treated himself with tight bandages to depress the clavicle and elevate the arm .

Many classification system were used for acromio clavicular dislocation but rockwood classification system is followed nowadays . First two types the treatment is mainly conservative and for type III to VI surgical treatment gives good results .Various surgical techniques published in last 15 years for acromioclavicular joint repair and reconstruction like bosworth screw fixation, tension band wiring ,superior clavicular hook plate , resection of lateral end of clavicle with coracoacromial ligament transfer(Weaver Dunn procedure ),but these

procedures reported with more number of complication and the results are not satisfactory . For better outcome it is important to know about the anatomy and biomechanics of shoulder joint and acromioclavicular joint. By reconstructing both the acromioclavicular and coracoclavicular ligaments with semitendinosus autograft it is possible to restore the near normal anatomy and stability(anteroposterior & vertical stability) of ac joint and good range of movements .It has the advantage of avoiding second surgery for implant removal , hardware related complications like hardware prominence ,implant breakage. Endobutton reduces the chances of clavicular fractures across the tunnels .MRI studies reports that regeneration of semitendinosus tendon after a period 9-12 months from harvesting ,so donor site morbidity(anteromedial instability) is not a major issue .

## HISTORY

In (460–377 BC) Hippocrates mentioned about acromioclavicular joint dislocations in his literature

Galen (129–199 AD) diagnosed his own AC dislocation received from wrestling in the Palaestra and he treated himself by tight bandages which depress the clavicle and elevate the arm.

In 1861 Samuel Cooper who credited for the first report of the surgical management of a displaced, painful AC joint dislocation .

In 1917, Cadenat described transfer of the coracoacromial ligament but the procedure was later popularized by Weaver and Dunn

## REVIEW OF LITERATURE

IN1946 Urist et al, demonstrated that the distal clavicle could be completely dislocated anteriorly and posteriorly (anteroposterior stability)away from the acromion process. However, vertical displacement of the clavicle, in relation to the acromion, occurs only after the CC ligaments are transected .

Fukuda et al,conducted a study with load-displacement tests after sequential ligament sectioning to determine individual contributions of the various ligaments to AC stability.

IN2011 Thomas et al,[4] compared five different techniques for reconstruction of AC joint and concluded that anatomic AC joint techniques gives biomechanically more stronger construct when compared to traditional techniques

IN 2010 Fraschini et al,[5] compared results of AC joint reconstruction using ligament augmentation and reconstruction system (LARS), Dacron vascular prosthesis and conservative treatment. When compare to conservative treatment surgical treatment provides better results. More no of complications associated with the use of Dacron prosthesis when compared to LARS.

IN 2012 Cook et al,[5] retrospectively reviewed results of CC ligament reconstruction using artificial graft passed through single clavicular tunnel. The single tunnel technique was associated with more no of complication like early loss of reduction and need for re-surgery .this study shows poor results with this technique .

IN 2013Xue et al,[6]. describedthat The clavicular tunnels were created according to anatomical landmarks for conoid and trapezoid ligaments .

IN 2012 Milewski et al,[7] retrospectively reviewed 27 cases of anatomic AC joint reconstruction using allogenic and autograft tendon. They reviewed 10 cases with coracoid tunnel and 17 cases of coracoid sling. They found a high incidence of complication with coracoid tunnel (80%) as compared to sling technique (35%).

IN 2013 Cook et al,[8] have reported 28.6% (8/28) failure rate at an average of 7.4 weeks. Medialization of clavicular tunnels more than 30% of the clavicle length was seen as a predictor for early loss of reduction (a ratio of 0.292 vs. 0.248;  $P = 0.012$ ). They have also concluded that proper tunnel positioning results into early return to duty when compared to malpositioned tunnels

IN 2015 Sapre et al,[9] conclude that this technique of reconstruction is anatomical, recreates the CC and AC ligaments avoiding need for coracoid tunnel with protection of the graft until it get vascularized and ligamentized.

IN 2015 Sapre, et al. [10] have reported that the semitendinosus graft was used to recreate coracoclavicular and AC ligaments with the added fixation with fiberwire tied over an endobutton over the clavicle for their 9 patients they concluded that The technique is near anatomic with added advantage of protecting the repair with fiber wire suture and also reducing the risk of clavicular fracture with endobutton placed on the superior surface of clavicle. It also avoids the risk of coracoid fracture.

Carofino and Mazzocca, et al,[11]. accurately measured clavicular bone tunnel sites prior to drilling

IN 2014 Shin et al ,[12] reported a method of passing the graft through a crossing pattern that medial limb of the graft was passed through the anterolateral bone tunnel, which recreated the trapezoid ligament laterally and the lateral limb of the tendon graft was placed through the posteromedial bone tunnel, which recreated the conoid ligament medially.

IN 2010 Turman et al,[14] reported on clavicular fractures after CC ligament reconstruction with a tendon graft. They Suggested the reason for fracture that placement of bioabsorbable screws that have the potential for osteolysis, insufficient patient compliance with the postoperative protocol. Another factor that the relatively larger bone tunnels and subsequent cortical breach.

IN 2016, Q. Naziri et al, [15] reported that tendon graft augmentation methods are very promising with both maximum load and displacement to failure. They suggested that the method of placing sutures continuously through the entire length of the graft offers greater load to failure and may also lead to greater pull out strength when used with screws in anatomic AC joint reconstruction.

In 2006 Mazzocca, Santangelo SA, Johnson ST et al, [16] A biomechanical evaluation of an anatomical coracoclavicular ligament reconstruction. *Am J Sports Med.* 2006;34:236–246.

Gerber et al, [17] evaluated patterns of pain and found that irritation to the AC joint produced pain over the AC joint, the anterolateral neck, and in the region in the anterolateral deltoid.

IN 2009 Pauly et al, described about prevalence of concomitant rotator cuff tear associated with high grade AC joint injuries. He reported 6 out of 40 patients (15%) had intra-articular pathology associated with AC joint separations.

In 1992, Wurtz et al, reported 4 cases of mid third clavicle associated with AC joint separation. He treated 3 patients with Bosworth screw fixation and one patient conservatively.



In 1987, Sturm and Perry et al, described about brachial plexus injury in blunt trauma to shoulder identified 2 patients with AC separations in 59 patients of brachial plexus injuries

### **Aim of the Study**

**A STUDY ON FUNCTIONAL OUTCOME OF BIOLOGICAL RECONSTRUCTION OF ACROMIOCLAVICULAR JOINT BY USING SEMITENDINOSUS GRAFT WITH ENDOBUTTON ( PROSPECTIVE STUDY)**

### **Objectives**

- To study the functional outcome of acromioclavicular ligament reconstruction using semitendinosus graft
- To provide pain-free, mobile shoulder

### **EPIDEMIOLOGY:**

Acromioclavicular joint injuries occurs in 9-11% of all shoulder injuries[1]

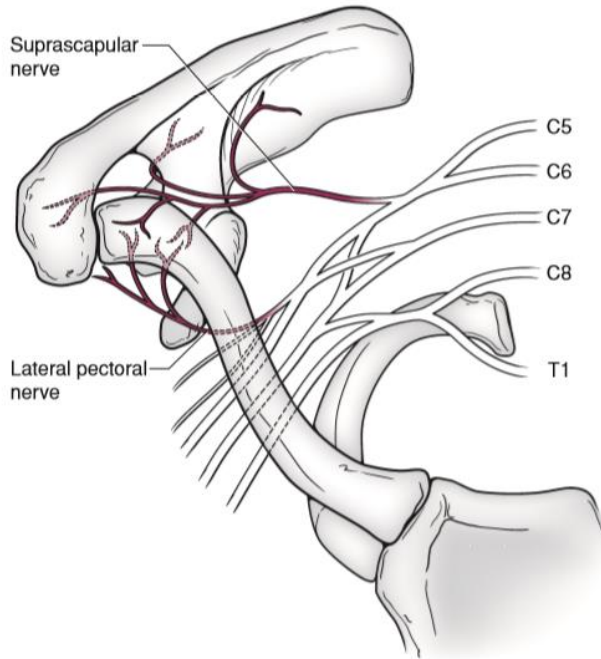
Overall incidence is 1.8 per 10000 in American population

Male to female ratio is 5 to 8.5 :1. 50.5% of all dislocations occurs in the age group between 20-39 years. The most common type is Rockwood type III. The most common mechanism of injury is sports injuries seen in contact sports athletes[2].

### **ANATOMY OF ACROMIOCLAVICULAR JOINT:**

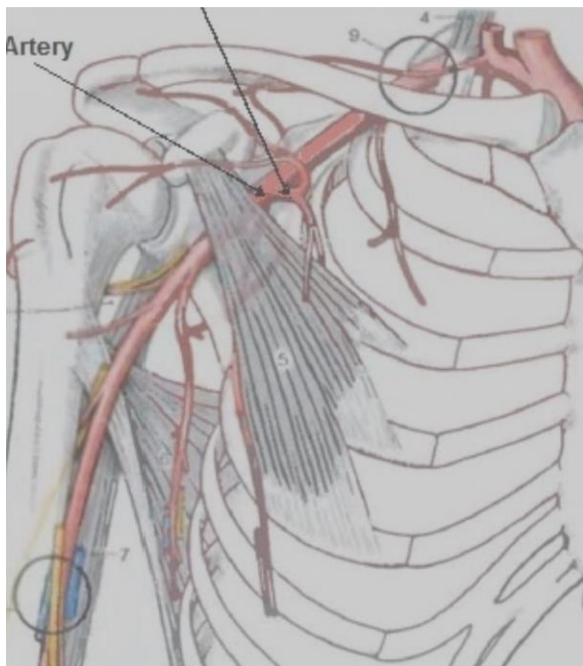
#### **ANATOMY**

AcromioClavicular joint is a diarthrodial joint. It is located between the acromion and lateral end of the clavicle. Within the AC joint, fibrocartilaginous disk of varying size and shape is present. In AP view the inclination of the AC joint is almost vertical, or it may be inclined downward and medially, with the clavicle overriding the acromion by an angle of 50 degrees. Approximately two types of fibrocartilaginous intra-articular disks present in AC joint —complete and partial (meniscoid). Branches of the axillary, suprascapular, and lateral pectoral nerves give innervations to AC joint.



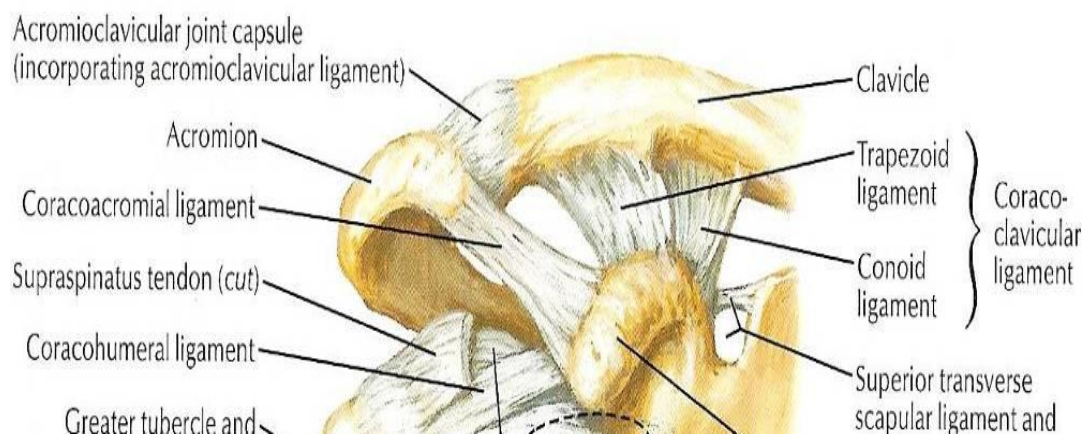
### BLOOD SUPPLY :

blood supply is mainly from the acromial branch of the thoracoacromial artery, the suprascapular artery and the posterior humeral circumflex artery.



## LIGAMENTS OF ACROMIOCLAVICULAR JOINT:

Acromioclavicular Ligaments and Coracoclavicular ligaments are the important ligaments which gives stability to AC joint . The AC ligaments gives anteroposterior stability and coracoclavicular ligaments gives vertical stability[3] .



## ACROMIOCLAVICULAR LIGAMENTS:

Anterior, posterior, superior, and inferior AC ligaments, surround the AC joint. Superior AC ligament fibers are the strongest of the capsular ligaments and blend with the fibers of the deltoid and trapezius muscles, which are attached to the superior aspect of the clavicle and acromion process. These muscle attachments adding stability to the AC joint. The AC ligaments stabilize the joint in an AP direction. The horizontal plane stability (anteroposterior) is given by the acromioclavicular ligaments to the AC joint[4] . The distance from the lateral

clavicle to the insertion of the superior AC ligament approximately 5.2 to 7 mm in women and 8 mm in men[5].

### CORACOCLAVICULAR LIGAMENT :

The CC ligament is a very strong, heavy ligament which provides vertical stability . The fibers run from the outer, inferior surface of the clavicle to the base of the coracoid process of the scapula.

It has two components:

1) conoid ligament

2)trapezoid ligament

The conoid ligament is more medial of the two ligaments which is cone shaped, with the apex of the cone attaching on the posteromedial side of the base of the coracoid process and The base is attached to the conoid tubercle on the posterior undersurface of the clavicle. Anatomical land mark of conoid tubercle is located at the apex of the posterior clavicular curve, which is at the junction of the lateral third of the flattened clavicle with the medial two-thirds of the triangular shaft. .Its length varies from 0.7 to 2.5 cm and width from 0.4 to 0.95 cm[4] .

The trapezoid ligament arises posterior to the attachment of the pectoralis minor tendon and anterolateral to the attachment of conoid ligament. Length and width of

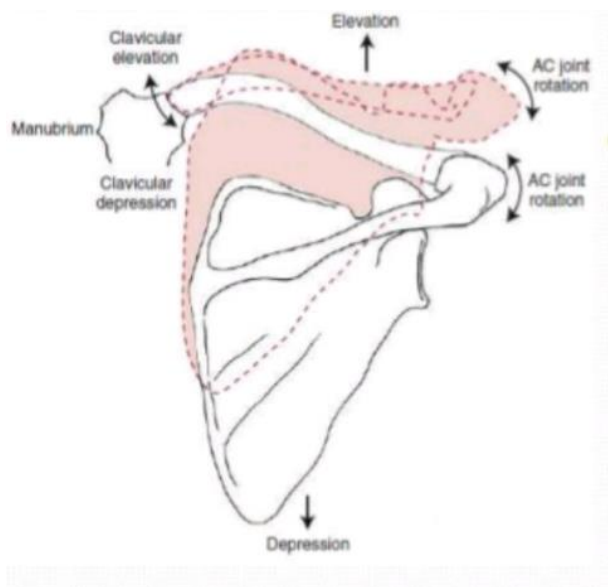
the trapezoid ligament is approximately 0.8 to 2.5 cm [4]. The trapezoid ligament extends superiorly to a rough line on the undersurface of the clavicle. It is located 1cm from the lateral end of clavicle[5]

## MOVEMENTS OF ACROMIOCLAVICULAR JOINTS:

THREE rotatory movements

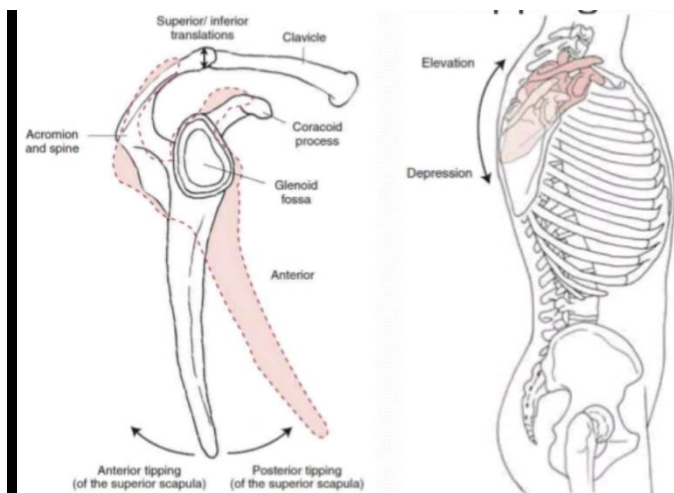
(i) Internal and External rotation:

During arm elevation clavicle rotates 40-50 degrees in relation to the long axis. This occurs in synchrony with scapular motion but the motion occurs at ac joint is only about 5-8 degrees[11].



(ii)Anterior and posterior tipping :

Anterior and posterior tipping and internal and external rotation at ac joint helps to maintain the scapular motions with thorax during elevation and depression[9]. Internal rotation of the scapula occurs only at the ac joint which results in prominent medial border of scapula



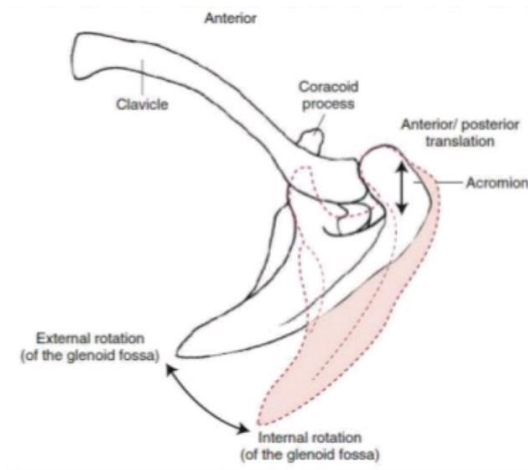
(iii)Upward and Downward rotation .

THREE translatory movements :

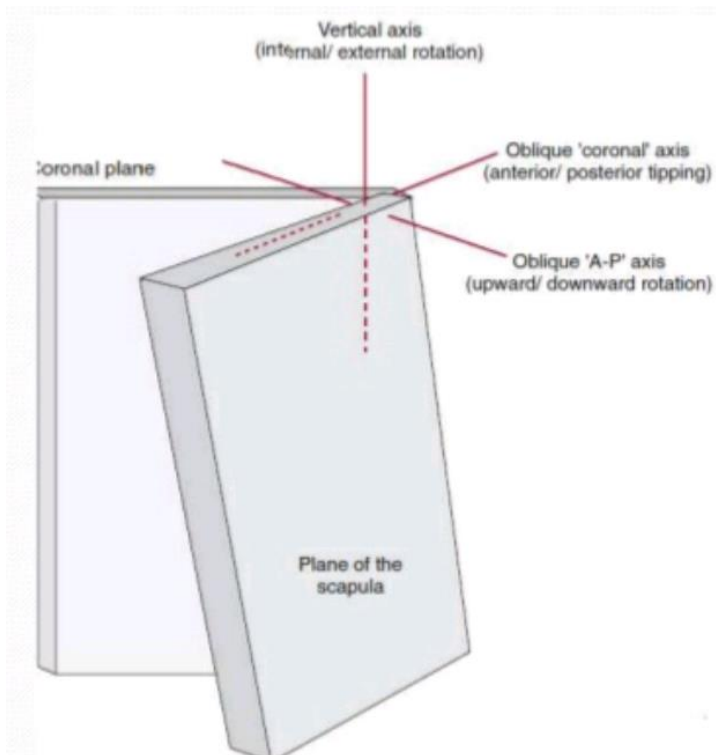
(i)Anteroposterior

(ii) Medial/ lateral

(iii)Superior inferior



### . AXIS AND PLANES FOR AC JOINT MOTION :



### BIOMECHANICS OF AC JOINT :

The biomechanics of the AC joint is concern with static stability, dynamic stability, and AC joint motion. The upper extremity and the axial



skeleton is connected by the clavicular articulations at the AC and SC joints. The upper extremities are suspended from the distal clavicles through the CC ligament. CC ligaments are the prime suspensory ligament of the upper extremity. AC joint stability is maintained mainly by the surrounding ligamentous structures, specifically the CC ligaments (conoid and trapezoid) and the AC capsule and ligaments. Following excision of the AC joint capsule, distal clavicle completely dislocated anteriorly and posteriorly away from the acromion process[3]. Vertical displacement of the clavicle, in relation to the acromion, occurs after the CC ligaments transection only. The contribution of the acromioclavicular, trapezoid, and conoid ligaments was determined at small and large displacements[6]. The AC ligaments are the primary restraint to both posterior (89%) and superior (68%) translation of the clavicle, the most common failure patterns seen with minimal displacements in most of the patients. Conoid ligament provided the primary restraint (62%) to superior translation seen in large displacements. In both large and small displacements, the trapezoid ligament serves as the primary restraint to AC joint compression. The trapezoid ligament has a greater resistance to posterior displacement of the clavicle and the conoid has a greater resistance in anterior displacement of the clavicle[7]. Posterior abutment of the clavicle against the acromion is avoided with only 5 mm of bone removal. AC joint capsule and ligaments maintaining AP stability of the AC joint. Larger resections of distal

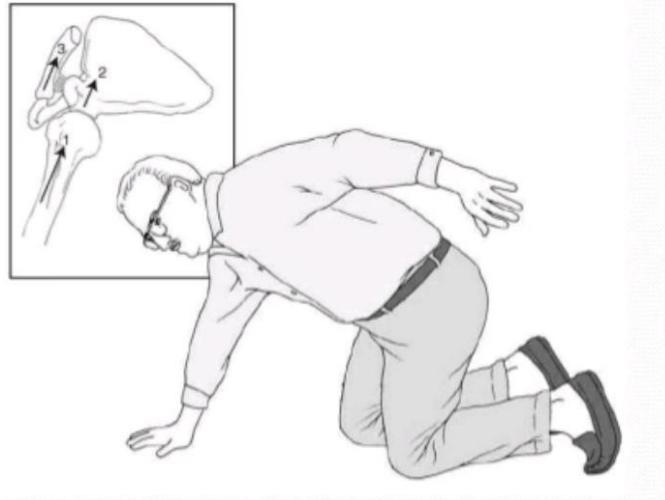
clavicle results in excessive posterior translation[8]. Thus ,The horizontal stability is controlled by the AC ligament and capsule.

The vertical stability is controlled by the CC ligaments. The CC ligament helps to couple glenohumeral abduction/ flexion to scapular rotation on the thorax. Full overhead elevation cannot be accomplished without combined and synchronous glenohumeral and scapulothoracic motion[10].As the clavicle rotates upward, it dictates scapulothoracic rotation by virtue of its attachment to the scapula—the conoid and trapezoid ligaments.

#### MECHANISM OF INJURY :

In low grade injuries ,

Injury pattern is dictated by direction and magnitude of the force vector. During Fall on an outstretched arm, which is locked in extension at the elbow, can drive the humeral head superior into the acromion typically causes low-grade AC joint injuries .



In High grade injuries ,

A medial directed force to the lateral shoulder which drives the acromion into and underneath the distal clavicle can result in higher degrees of injury and subsequently more displacement[11]. Compressive (medial) and shear (vertical) force across the joint, while falling or being tackled with the shoulder with arm in adducted position , typically produces a higher degree of displacement .

This force is enough to both the AC and coracoclavicular (CC) ligaments disruption . In first disruption of the AC ligaments, followed by disruption of the CC ligaments, and finally disruption of the fascia over the clavicle which connects the deltoid and trapezius muscle attachments[12].



The upper extremity loses its suspensory support from the clavicle and the scapula and associated glenohumeral articulation displaces inferiorly secondary to forces of gravity. Slight upward displacement of the clavicle from the pull of the trapezius muscle, describes the characteristic inferior displacement of the shoulder and arm. In complete AC dislocation the major deformity is a downward displacement of the shoulder when compare to axial skeleton . In very severe injuries inferior dislocation of the clavicle under the coracoid occurs is due to direct force onto the superior surface of the distal clavicle[11];

### **ASSOCIATED INJURIES:**

Fractures of the lateral third clavicle and coracoids are associated with ac joint separation . Wurtz et al , reported 4 cases of mid third clavicle associated with

ac joint separation he treated 3 patients with Bosworth screw fixation and one patient conservatively[13].

Bipolar injuries , both sterno clavicular and acromioclavicular joints separations also known as floating clavicle is typically seen in high velocity injuries

Intraarticular pathology: 15-18% of intraarticular pathology such as SLAP lesion, supraspinatous tear, articular sided rotator cuff tear in high grade injuries .Pauly et al , reported 6 out of 40 patients (15%) had intar articular pathology associated with ac joint separations[14].

Brachial plexus injuries are associated with high grade ac joint separations. Sturm and Perry, identified 2 patients with AC separations in 59 patients of brachial plexus injuries[15].

Coracoclavicular ossification , distal clavicle osteolysis ,are reported with ac joint injuries

Scapulothoracic dissociation are associated with high garde ac joint injuries in which lateral displacement of scapula with neurovascular abnormalities may be present due to traction injuries . but it is missed due to associated head injury .

**CLINICAL FEATURES:**

Pain originating from the anterior-superior aspect of the shoulder, but it may also be seen on the anterolateral aspect of the neck, anterior aspect of the shoulder and glenohumeral joint because of the innervation of the AC joint capsule and the above structures by the lateral pectoral nerve [16].

**CLINICAL TRIAD** of point tenderness at the AC joint, pain exacerbation with cross-arm adduction, and relief of symptoms by injection of a local anesthetic agent.

The cross-arm adduction test : performed with the arm elevated to 90 degrees and adducted across the chest with the elbow bent at approximately 90 degrees. A positive test produces pain specifically at the AC joint. This is due to compression across the AC joint with that motion.

Shoulder drop sign : AC joint capsule and ligaments and the CC ligaments are disrupted which allows inferior translation of the limb and produces shoulder drop sign .

shrug test is used to differentiate reducible (IIIA) and irreducible (IIIB) injuries and intactness of deltopectoral fascia

## **CLASSIFICATION ACROMIOCLAVICULAR JOINT INJURIES:**

Acromioclavicular joint (ACJ) are classified according to the findings from the physical examination and anteroposterior and axillary radiographs. The degree of damage to the acromioclavicular and the coracoclavicular ligaments as well as the deltoid and trapezius attachments are also considered. The most common classification used in the past was the Allman and Tossy classification (Allman, [1967](#); Tossy et al., [1963](#)) [17]

Type I -AC joint remains well aligned but the ligaments are strained ,

TYPE II -Complete rupture of acromioclavicular ligaments and strain of coracoclavicular ligaments ( displacement less than 100% of its width)

TYPE III- Both ac & cc ligaments ruptured (DISPLACEMENT > 100%-300%)

ROCKWOOD CLASSIFICATION, added 4, 5 and 6 to complete the classification (Rockwood et al., [1998](#)) [18,19]

TYPE I – Sprain of acromioclavicular ligament only

TYPE II- Acromioclavicular ligaments and joint capsule.

Disrupted . Coracoclavicular ligaments intact. 50% vertical subluxation of clavicle.

TYPE III - Acromioclavicular ligaments and capsule disrupted. Coracoclavicular ligaments disrupted. Acromioclavicular joint dislocation with clavicle displaced superiorly and complete loss of contact between clavicle and acromion.

TYPE IV- Acromioclavicular ligaments and capsule disrupted. Coracoclavicular ligaments disrupted. Acromioclavicular joint dislocation and clavicle displaced posteriorly into or through trapezius muscle (posterior displacement confirmed on axillaryradiograph)

TYPE V- Acromioclavicular ligaments and capsule disrupted. Coracoclavicular ligaments disrupted. Acromioclavicular joint dislocation with extreme superior elevation of clavicle ([100](#) to [300](#)% normal). Complete detachment of deltoid and trapezius from distal clavicle.

TYPE VI- Acromioclavicular ligaments and capsule disrupted. Coracoclavicular ligaments disrupted. Acromioclavicular joint dislocation with clavicle displaced inferior to acromion and coracoid process.





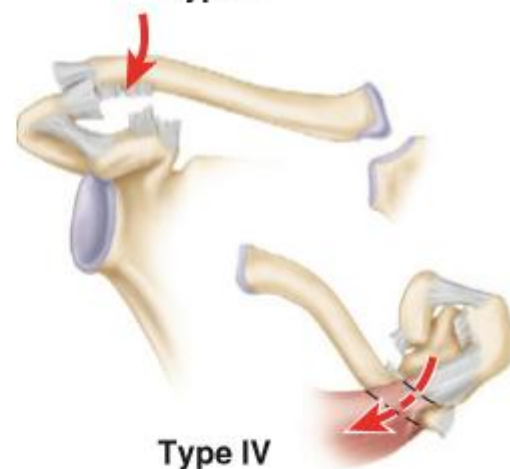
Type I



Type II



Type III



Type IV



Type V



Type VI

NEVIASER CLASSIFICATION : subdivided type III into

IIIA-acromioclavicular joint reducible with upward pressure under elbow

III B-AC joint not reducible with upward pressure

Treatment plan will be changed according to the reducibility of ac joint. If the joint reduced with upward pressure the patient can be treated conservatively and if not reduced surgery is indicated

### **RADIOGRAPHIC EVALUATION :**

#### **X-RAY CHEST WITH BOTH SHOULDERS:**

X-ray chest PA view with both shoulders will identify acromioclavicular disruptions , associated fractures of clavicle, humerus ,scapula, and chest injury.

#### **ZANCA VIEW:**

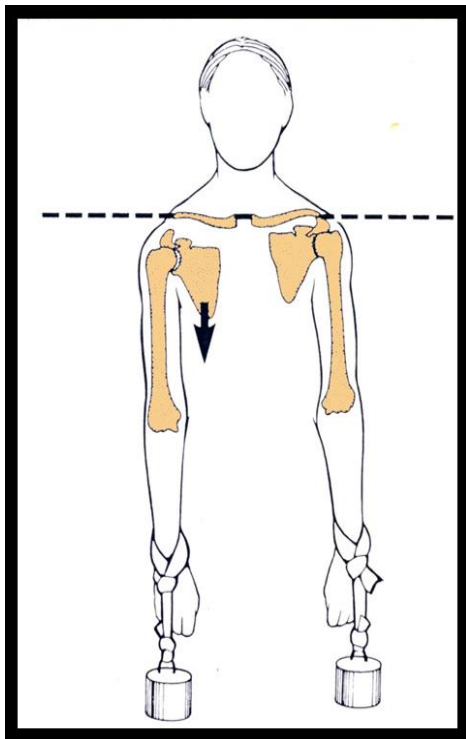
normally the spine of scapula will obscure acromion and clavicle this is overcome by 10-15 degrees of cephalic tilt of the x- beam . This not only visualize the under surface of clavicle but also we can measure the coracoclavicular distance . Normal coracoclavicular distance is between 11-13mm and there should not be any difference of more than 5mm between right and left side [20]



## ZANCA VIEW

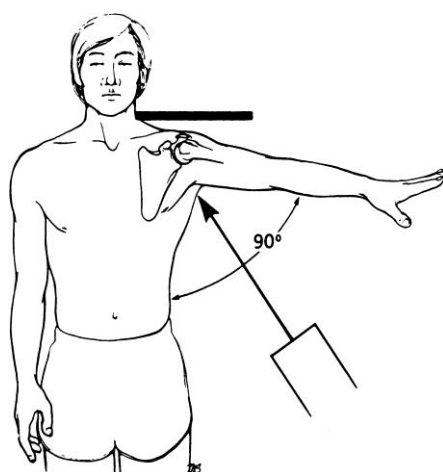
### Stress Radiograph:

stress radiographs are taken by taking the anteroposterior view with the weight hanging by the wrist .



## AXILLARY VIEW:

Cassette is placed more medially on the superior aspect of the shoulder to expose the lateral third of the clavicle. This view shows any posterior displacement of the clavicle as well as any small fractures of the coracoid that may be missed on anteroposterior view.



## Stryker Notch View :

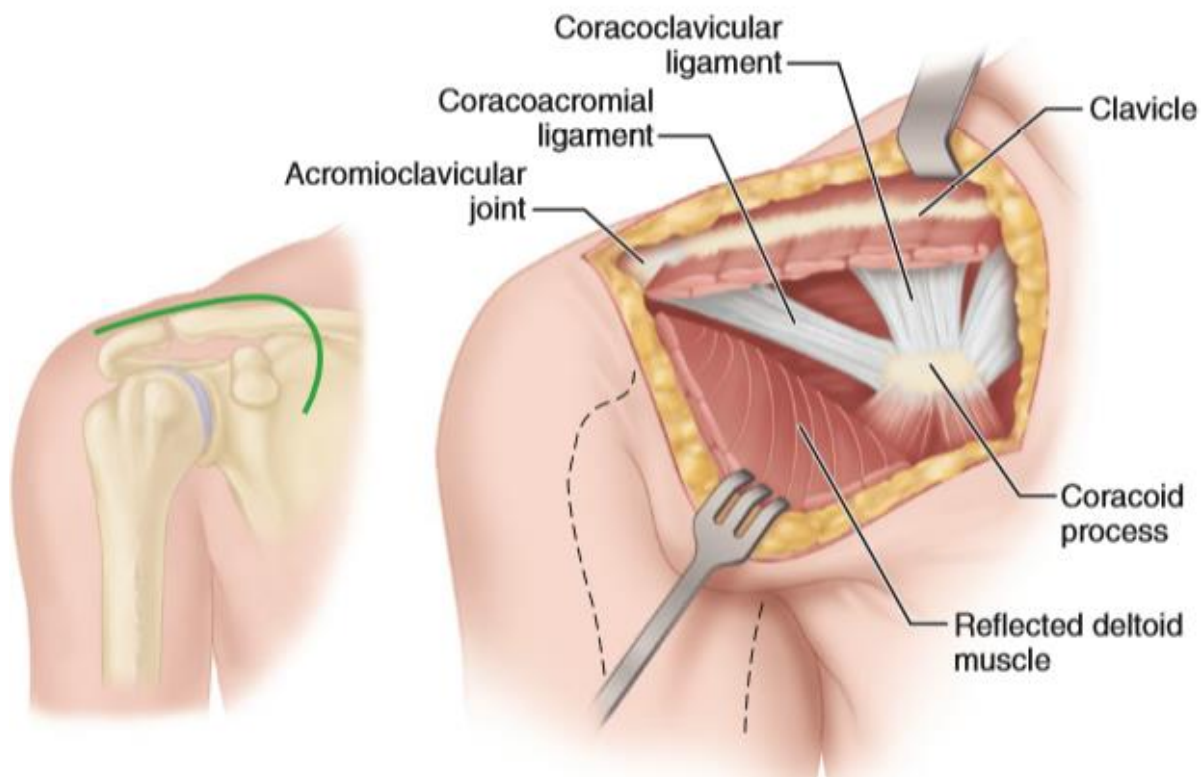
A coracoid process fracture is a variant of AC joint injury in some cases. Coracoid fracture should be suspected when there is an AC joint dislocation on the AP projection, with the normal CC distance, or equal when compare to the opposite, uninjured side. Stryker notch view is the best view to identify the coracoids fracture. This view is taken with the patient in supine and the arm elevated over the head with the palm behind the head. The humerus is parallel to

the longitudinal axis of the body, with the elbow pointed straight toward the ceiling. This is difficult to obtain in acutely injured shoulder.



#### SURGICAL APPROACH: (ROBERTS)

Curved incision made along the anterosuperior margin of the acromion and the lateral one fourth of the clavicle to expose the origin of the deltoid and free it from the clavicle and the anterior margin of the acromion. Deltoid is retracted to expose the coracoid and the capsule of the acromioclavicular joint.



### Graft preference :

semitendinosus autograft was used in all the patients because of the sufficient length (110-220mm which is necessary for reconstruction ) thickness



Clavicular tunnels preparation :

Two tunnel technique[24,25]

The bone tunnels were made in the anatomic locations of the coracoclavicular ligaments. The tunnel for conoid ligament was placed 5cm[22] medial to the AC joint at the posterior aspect of the clavicle and directed at 30degrees anterior, aiming toward the coracoids[21]. The tunnel was drilled in a gradual manner using a 3.5 drill bit, followed by a 4.5 drill bit. Next, the trapezoid ligament tunnel was prepared in the same manner. It was placed 1cm from the lateral edge of the clavicle at its center. This was again directed 30degrees anterior toward the coracoid.

Graft preparation and passage

A semitendinosus autograft harvest from an oblique skin incision centered over the tibial insertion of the pes anserine tendons. High-strength nonabsorbable suture is used to taper the end of the graft. The stitch should also 'bullet' the end of the graft by making the distal diameter as small as possible. This will facilitate graft passage through a small tunnel and prevent fraying of the graft edges. The graft first passed beneath the coracoid, using a curved clamp or curved suture passing device. high-strength, nonabsorbable suture( no 5 ethibond) also

passed with the graft to provide additional nonbiologic fixation. The graft passed from medial to lateral under direct visualization.

### Graft fixation

The AC joint was reduced by pushing up on the elbow to elevate the scapulohumeral complex. Before fixation, the quality of reduction was examined visually to ensure acceptable reduction. The number 5 ethibond that accompanied the graft tied on the superior aspect of the clavicle with endobutton . The grafts are secured by tying it and suturing the tendons on themselves above the clavicle[26,27].The remaining graft is fixed with the acromian in order to replace the acromioclavicular ligaments[23]. After thorough wound wash the deltotrapezial fascia closed with interrupted nonabsorbable sutures. Both attachments of the anterior deltoid fascia and the trapezius fascia are brought together with interrupted stitches. The knots are placed on the posterior side of the flap to minimize skin irritation.

### **FUNCTIONAL EVALUATION:**

#### **Two scoring system used**

##### **(1)ASES SCORE**

##### **(2) CONSTANT SCORE**



## ASES Shoulder Score

Name .....

Age .....

Date .....

1. Usual Work

2. Usual Sport/Leisure activity?

3. Do you have shoulder pain at night?

Yes

No

4. Do you take pain killers such as paracetamol (acetaminophen), diclofenac,

Yes

No

5. Do you take strong pain killers such as codeine, tramadol, or morphine?

Yes

No

6. How many pills do you take on an average day?

7. Intensity of pain?

10     9     8     7     6     5     4     3     2     1

Pain as bad as it can be

8. Is it difficult for you to put on a coat?

Unable to do

Very difficult to do

Somewhat difficult

Not difficult

9. Is it difficult for you to sleep on the affected side?

Unable to do

Very difficult to do

Somewhat difficult

Not difficult

10. Is it difficult for you to wash your backside up bra?

Unable to do

Very difficult to do

Somewhat difficult

Not difficult

11. Is it difficult for you manage toileting?

Unable to do

Very difficult to do

Somewhat difficult

Not difficult

12. Is it difficult for you to comb your hair?

Unable to do

Very difficult to do

Somewhat difficult

Not difficult

13. Is it difficult for you to reach a high shelf?

Unable to do

Very difficult to do

Somewhat difficult

Not difficult

14. Is it difficult for you to lift 10lbs. (4.5kg) above your shoulder?

Unable to do

Very difficult to do

Somewhat difficult

Not difficult

15. Is it difficult for you to throw a ball overhead?

Unable to do

Very difficult to do

Somewhat difficult

Not difficult

16. Is it difficult for you to do your usual work?

Unable to do

Very difficult to do

Somewhat difficult

Not difficult

17. Is it difficult for you to do your usual sport/leisure activity?

Unable to do

Very difficult to do

Somewhat difficult

Not difficult

The Total ASES score is:

## Constant Shoulder Score

Clinician's Name: \_\_\_\_\_

Patient's Name: \_\_\_\_\_

Answer all questions, selecting just one unless otherwise stated

During the past 4 weeks.....

### 1. Pain

- Severe  
 Moderate  
 Mild  
 None

### 2. Activity Level (check all that apply)

- Unaffected Sleep  
 Full Recreation/Sport  
 Full Work

### 3. Arm Positioning

- Up to Waist  
 Up to Xiphoid  
 Up to Neck  
 Up to Top of Head  
 Above Head

### 4. Strength of Abduction [Pounds]

- 0  
 1-3  
 4-6  
 7-9  
 10-12  
 13-15  
 15-18  
 19-21  
 22-24  
 >24

### RANGE OF MOTION

#### 5. Forward Flexion

- 31-60 degrees  
 61-90 degrees  
 91-120 degrees  
 121-150 degrees  
 151-180 degrees

#### 6. Lateral Elevation

- 31-60 degrees  
 61-90 degrees  
 91-120 degrees  
 121-150 degrees  
 151-180 degrees

#### 7. External Rotation

- Hand behind Head, Elbow forward  
 Hand behind Head, Elbow back  
 Hand to top of Head, Elbow forward  
 Hand to top of Head, Elbow back -  
 Full Elevation

#### 8. Internal Rotation

- Lateral Thigh  
 Buttock  
 Lumbosacral Junction  
 Waist (L3)  
 T12 Vertebra  
 Interscapular (T7)

The Constant Shoulder Score is: 0

#### Grading the Constant Shoulder Score

>30 Poor

21-30 Fair

11-20 Good

<11 Excellent

## **METHODOLOGY**

### AIM

- ⊙ A STUDY ON ANALYSIS OF FUNCTIONAL OUTCOME OF BIOLOGICAL RECONSTRUCTION OF ACROMIOCLAVICULAR JOINT INJURIES

### OBJECTIVE:

- ⊙ To study the functional outcome of acromioclavicular joint reconstruction using semitendinosus graft with endobutton

To provide pain-free, mobile shoulder

**Design:** Prospective study

**Period:** Aug 2015 to September 2017

**Materials and methods:**

**Sample size:** 14 cases were taken up for our study

## INCLUSION CRITERIA:

1. acromioclavicular joint disruption rockwood type III to type VI
2. Skeletal mature patients of both sexes

## EXCLUSION CRITERIA:

1. Comorbid conditions not permitting major surgical procedures
2. Patients with rockwood type I,II
3. Poor local skin conditions

## Source of Data

patients with acromioclavicular joint ligament disruption type III to type VI admitted at Govt Rajaji hospital in the dept of Orthopaedics & Traumatology, Madurai were taken up for study after obtaining informed consent. All the patients selected for study were examined according to protocol, associated injuries were noted and clinical and lab investigations carried out in order to get fitness for surgery. Consent of the patient was obtained for surgery. Patients were followed till **good functional outcome** is achieved **Clinically** as well as **Radiologically**. **14 cases** were studied.

- **Pre operative preparation:** Patients underwent a pre-operative evaluation including the following parameters : Hb, blood sugar, ECG, RFT ,x ray chest inorder to get fitness for surgery

#### X-RAYS:

1. stress x ray zanca view,
2. shoulder ap view, and
3. axillary lateral view used assess the joint

#### **Implants and instruments:**

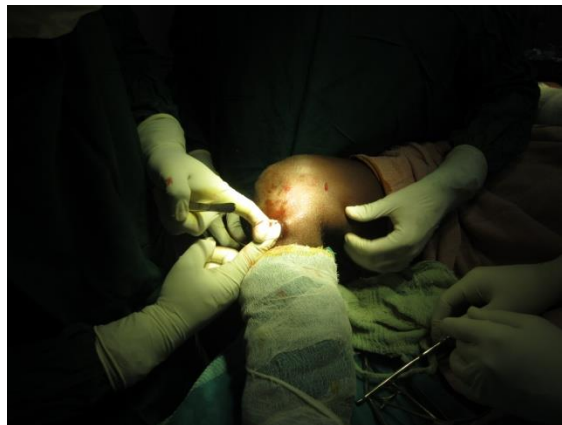
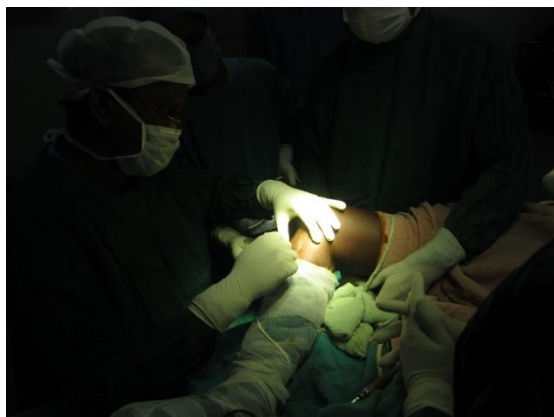


#### Anaesthesia:

General anaesthesia(or)intersclenae block with paravertebral block& spinal anaesthesia

## PROCEDURE:

graft harvesting: The leg is externally rotated and the knee-joint flexed to 60°. The skin is incised 2 cm distally and 1 cm medially to the tibial tuberosity along Langer's lines approximately 4 cm in length.



. skin sub cutaneous tissue incised pes anserine identified The more inferior of the two tendons, is the semitendinosus-tendon, is delivered with the use of tendon stripper wound wash given wound closed in layers .

## graft preparation:

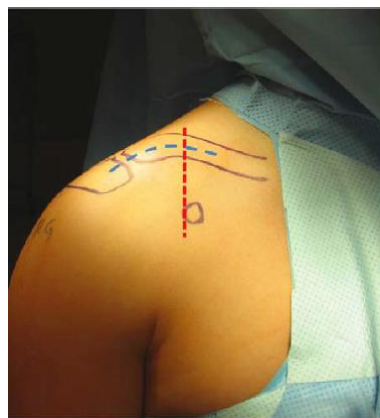
Semitendinosus autograft of approximately 110 mm 220mm was harvested . The graft is prepared with a bunnel (fishing hook) stitch of high-strength no 5 ethibond ( nonabsorbable suture).



Frayed ends of the graft are excised to allow easy passage.

POSITION: Beech chair position.

1) Incision -5cm incision made from the tip of acromian to the lateral third of clavicle



2) skin subcutaneous tissue incised .

3) skeletanization of the clavicle done by erasing the trapezius and deltoid from its attachment

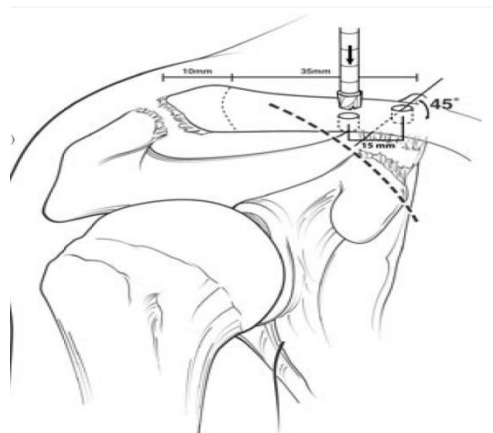


4)Clavicular tunnels :

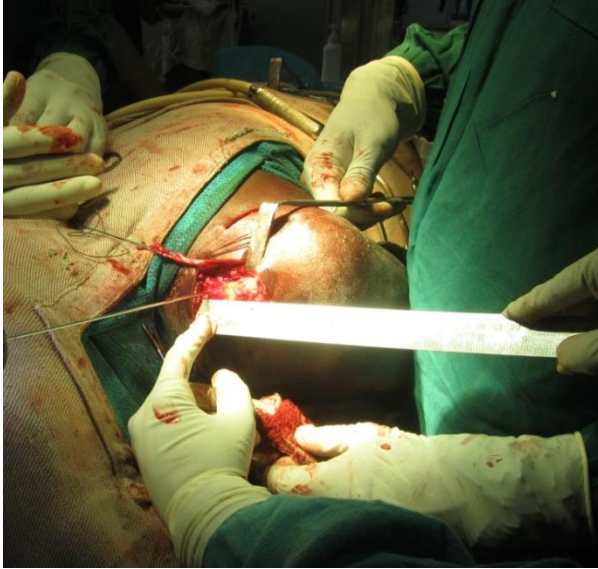
Conoid tunnel :45mm medial to lateral end of clavicle( posteromedial )

Trapezoid tunnel:30 mm medial to lateral end of clavicle(anteriolateral )

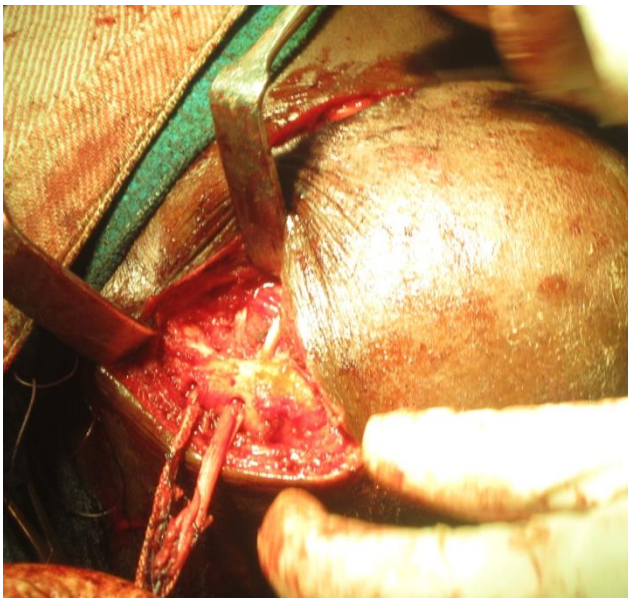
1cm of lateral end clavicle osteotomy done







5) Corocoid process exposed through longitudinal split .semitendinous graft passed around the corocoid process and through the clavicular tunnels with 5 ethibond sutures.



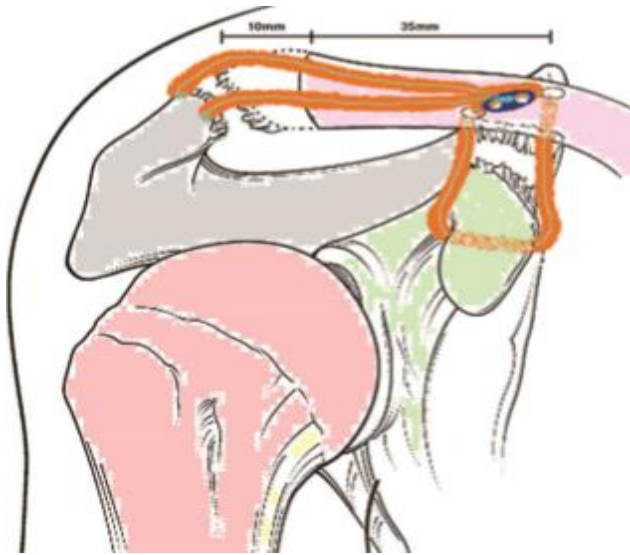
6) reduction tried and secured with endobutton



7) Remaining limbs of the graft are sutured with ac joint



8)wound closed and sterile dressing applied



#### POST OPERATIVE PROTOCOL:

1<sup>st</sup> Eot -2<sup>nd</sup> pod

2<sup>nd</sup>,3<sup>rd</sup> Eot-- 5<sup>th</sup>,7<sup>th</sup> pod

Suture removal-10<sup>th</sup> pod.

Pendulum exercise for first four weeks.

Active assisted abduction exercise started after 4 weeks.

Muscle strengthening exercise after 8 weeks

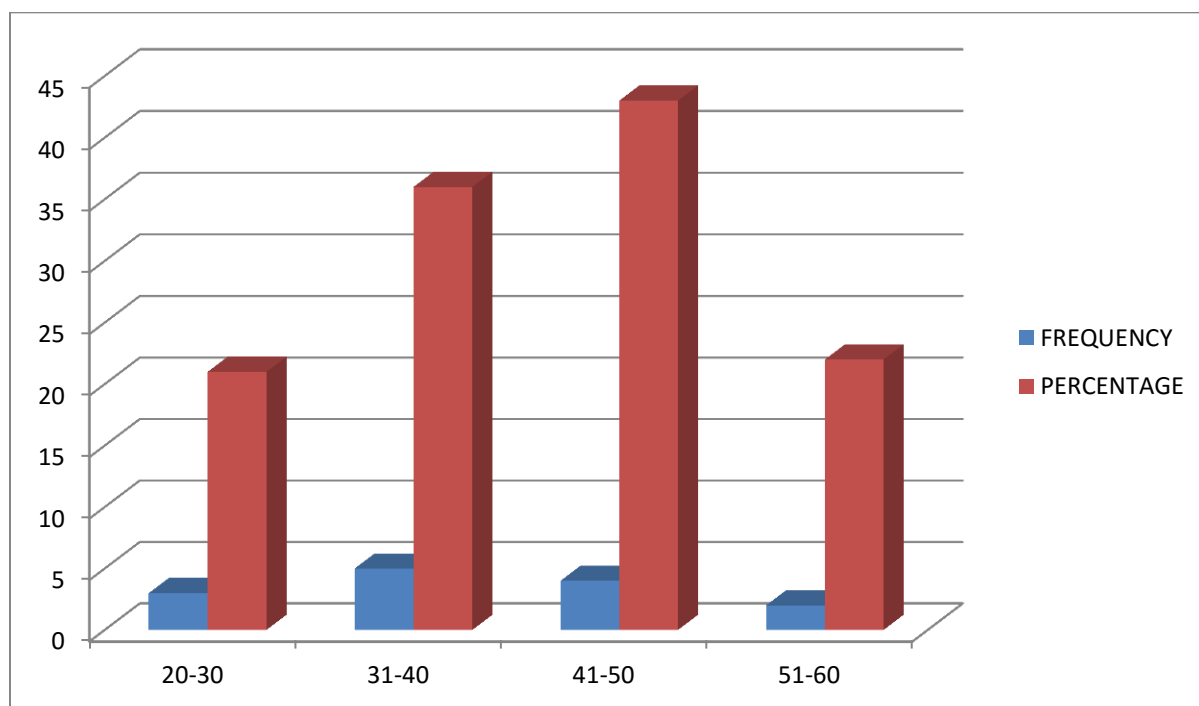
## OBSERVATION&RESULTS

### AGE DISTRIBUTION :

Age of the patients ranges from 26-60years with the mean age of 39 years.

Among 14 patients studied 57% (8)of patients were 20-40 years of age .it shows increased incidence among in younger population when compare to older population

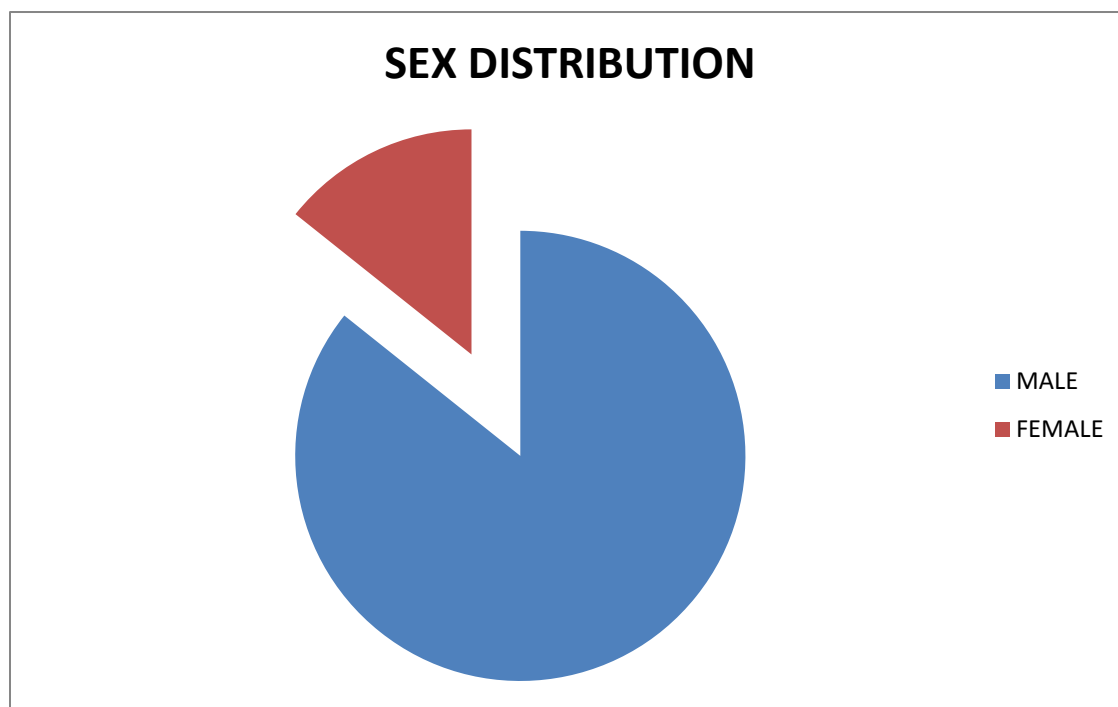
AGE IN YEARS	FREQUENCY	PERCENTAGE
20-30	3	21
31-40	5	36
41-50	4	26
51-60	2	14



**SEX DISTRIBUTION :**

Out of 14 patients ,12patients were male 2 were female .it comes around 86 % of male predominance it reflects the high prevalence among male population

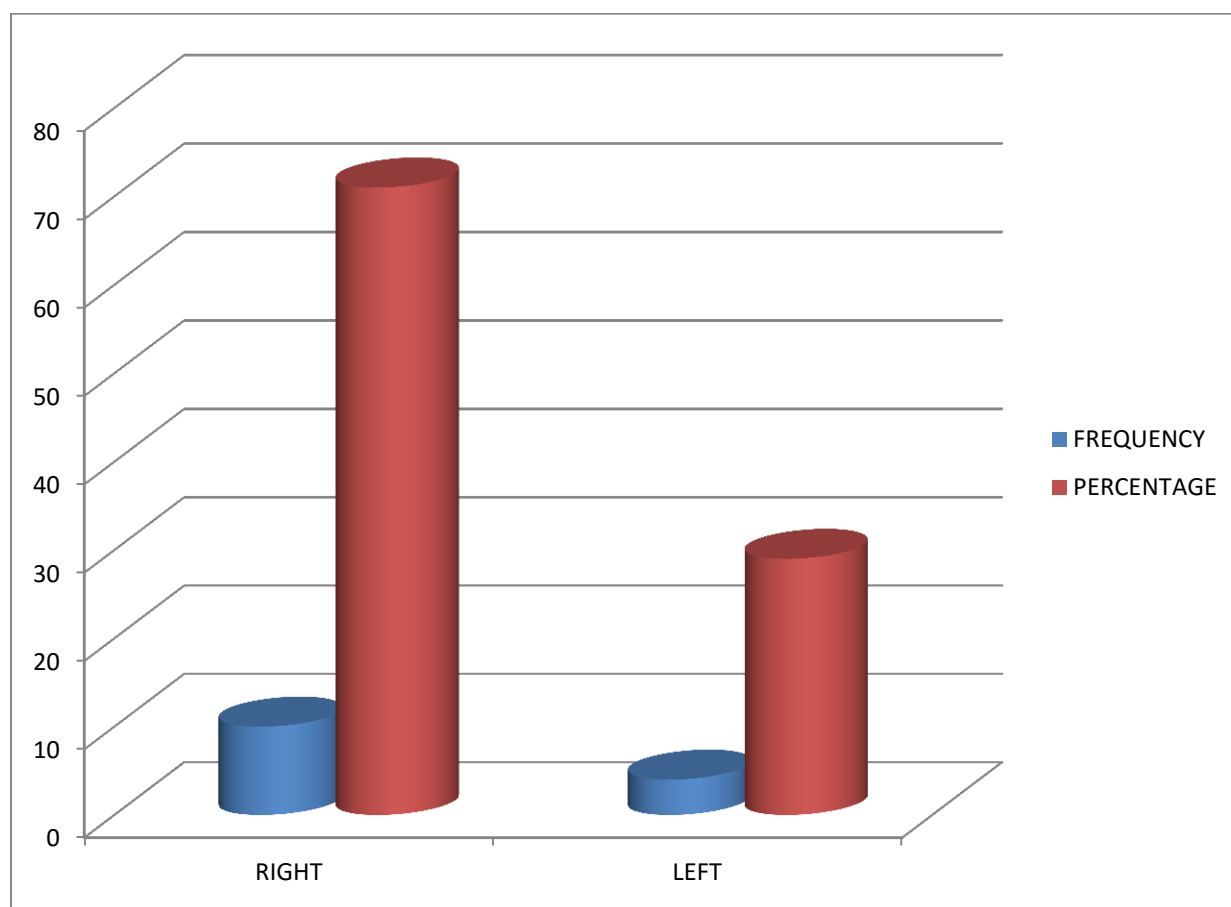
SEX	FREQUENCY	PERCENTAGE
MALE	12	86
FEMALE	2	14



**SIDE DISTRIBUTION:**

Out of 14 patients studied 10 patients were affected with right sided injury and 4 were left sided injury with the percentage of 70% on the right side

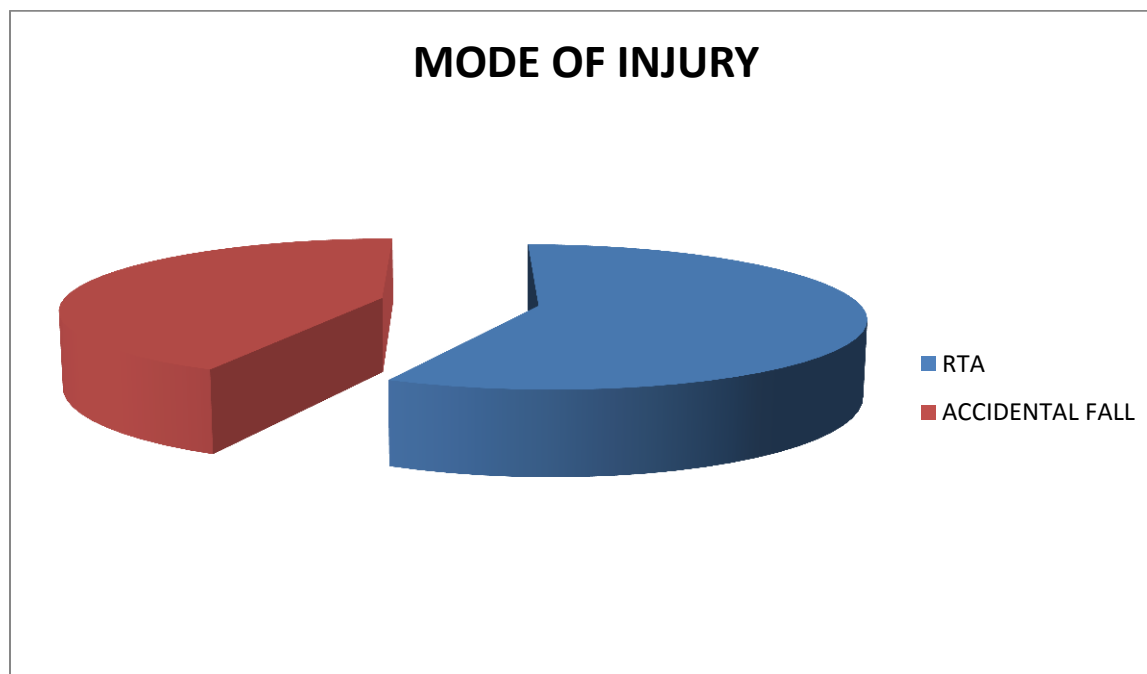
SIDE	FREQUENCY	PERCENTAGE
RIGHT	10	70
LEFT	4	30



**MODE OF INJURY:**

In my study most of the patients were manual labourer and motor vehicle users than the sports persons .out of 14 patients 8 were suffered from road traffic accidents with the percentage of 57%

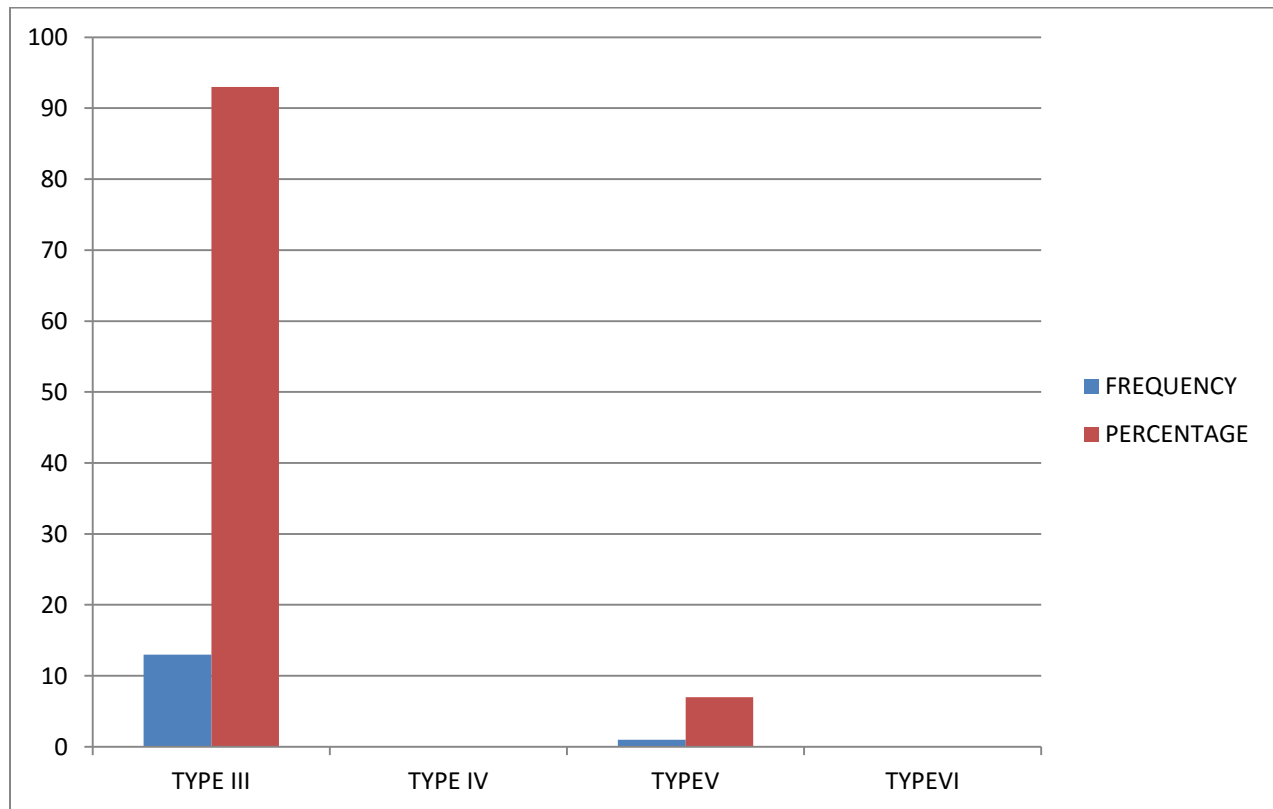
MODE OF INJURY	FREQUENCY	PERCENTAGE
RTA	8	57
ACCIDENTAL FALL	6	43



**TYPE DISTRIBUTION:**

Out of 14 patients 13 were type III and one patient was type v none of the patients reported with type IV & TYPEVI

TYPE	FREQUENCY	PERCENTAGE
TYPE III	13	93
TYPE IV	0	0
TYPEV	1	7
TYPEVI	0	0



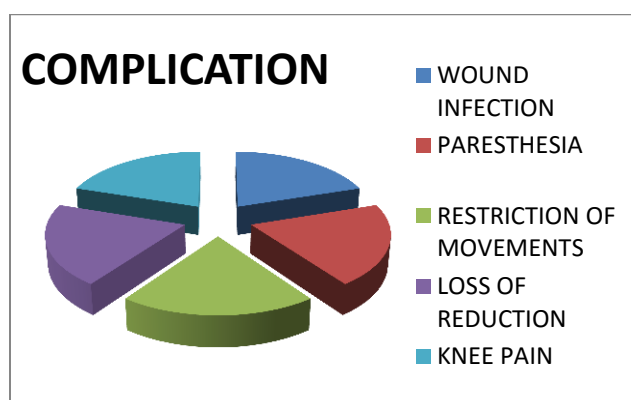


## COMPLICATION:

One patient had donor site complication and 2 patients with surgical site complication and one patient has restricted range of motions . One patient complaints of knee pain while walking and it resolved with due course of time .

One patient had paresthesia over surgical site for 3 months and she recovered fully in the next follow-ups. One patient had superficial infection over the surgical site and treated with antibiotics . The infection was settled in the next follow-ups . The same patient had restricted range of movements finally she achieved up to 100 degrees of shoulder abduction after physiotherapy.

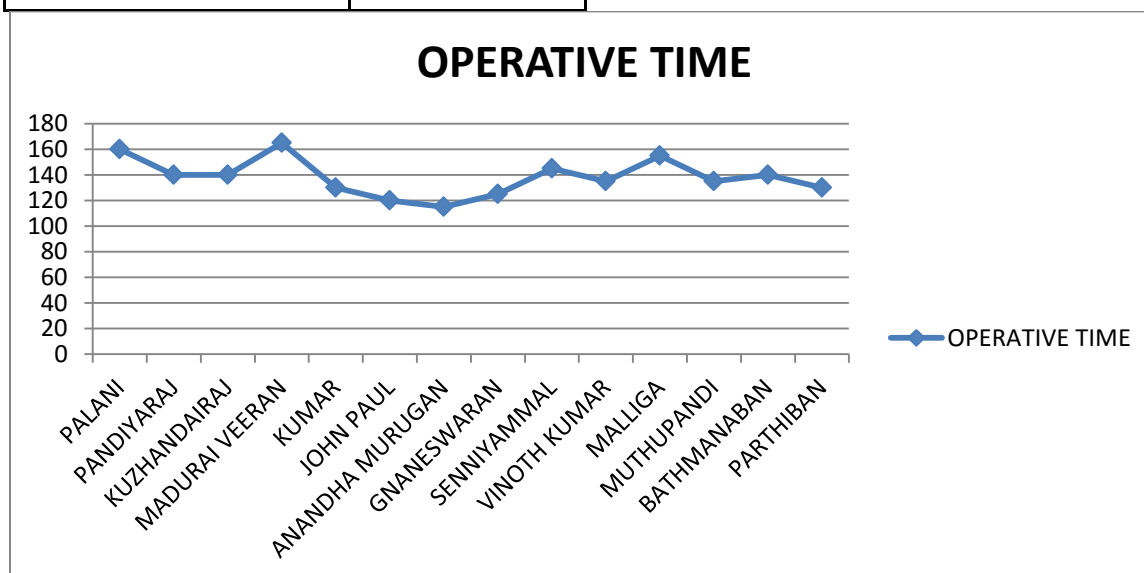
COMPLICATION	FREQUENCY
WOUND INFECTION	1
PARESTHESIA	1
RESTRICTION OF MOVEMENTS	1
LOSS OF REDUCTION	1
KNEE PAIN	1



**OPERATIVE TIME:**

OPERATIVE TIME VARIES FROM 115 MINS TO 165 MINS WITH A MEAN OPERATIVE PERIOD OF 138 MINS

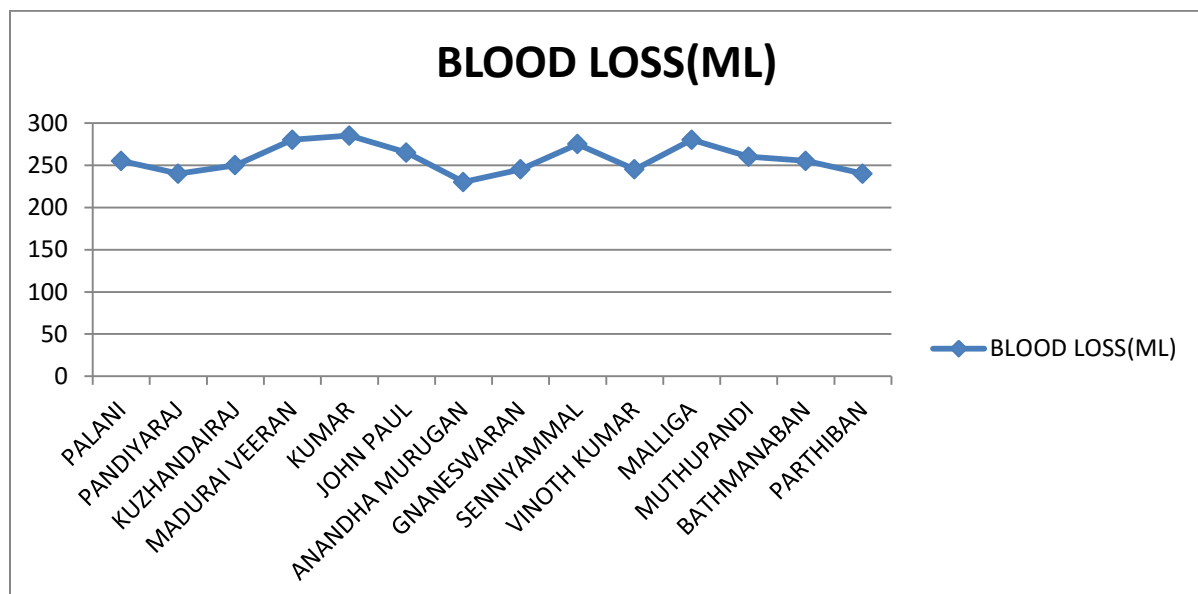
PATIENTS	OPERATIVE TIME
PALANI	160
PANDIYARAJ	140
KUZHANDAIRAJ	140
MADURAI VEERAN	165
KUMAR	130
JOHN PAUL	120
ANANDHA MURUGAN	115
GNANESWARAN	125
SENNIYAMMAL	145
VINOTH KUMAR	135
MALLIGA	155
MUTHUPANDI	135
BATHMANABAN	140
PARTHIBAN	130



**BLOOD LOSS:**

BLOOD LOSS RANGES FROM 230ML-280ML .NONE OF MY PATIENTS RECEIVES BLOOD TRANSFUSION

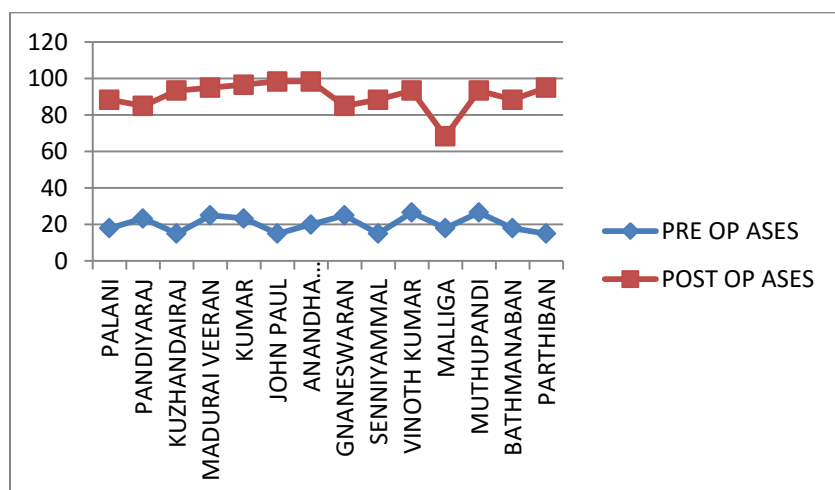
PATIENT'S NAME	BLOOD LOSS(ML)
PALANI	255
PANDIYARAJ	240
KUZHANDAIRAJ	250
MADURAI VEERAN	280
KUMAR	285
JOHN PAUL	265
ANANDHA MURUGAN	230
GNANESWARAN	245
SENNIYAMMAL	275
VINOTH KUMAR	245
MALLIGA	280
MUTHUPANDI	260
BATHMANABAN	255
PARTHIBAN	240



## PREOP AND POST OP ASES SCORE :

POST OPASES SCORE INCREASED SIGNIFICANTLY WHEN COMPARE TO PRE OP WHICH INDICATE BETTER OUTCOME WITH THE TREATMENT

PATIENT NAME	PRE OP ASES	POST OP ASES
PALANI	18	88.3
PANDIYARAJ	23.3	84.9
KUZHANDAIRAJ	15	93.3
MADURAI VEERAN	25	94.9
KUMAR	23.3	96.6
JOHN PAUL	15	98.3
ANANDHA MURUGAN	20	98.3
GNANESWARAN	25	84.9
SENNIYAMMAL	15	88.3
VINOTH KUMAR	26.6	93.3
MALLIGA	18	68.3
MUTHUPANDI	26.6	93.3
BATHMANABAN	18	88.3
PARTHIBAN	15	94.9

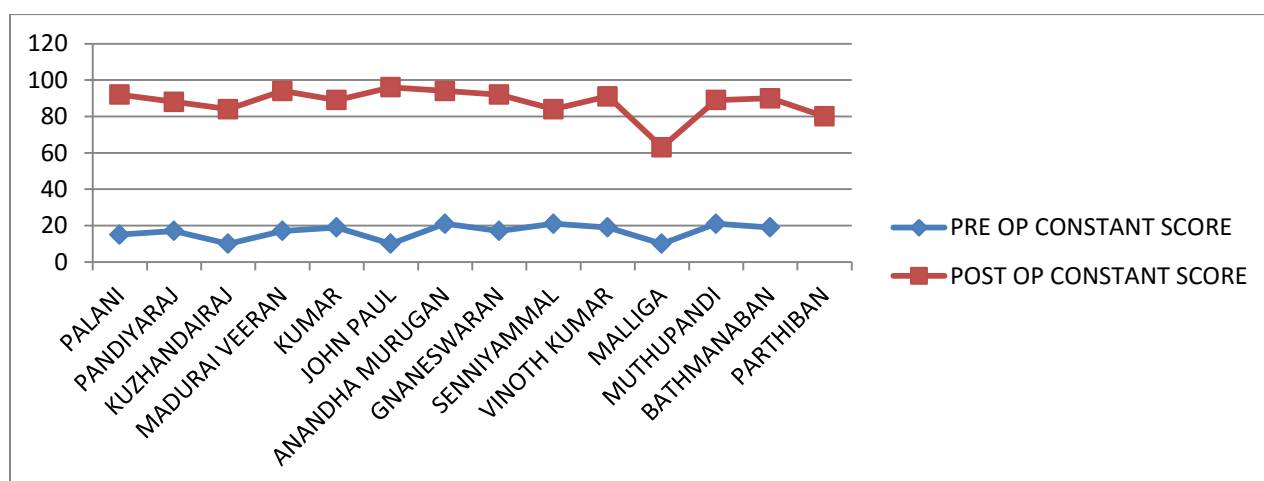


## PREOP AND POST OP CONSTANT SCORE :

POST OP CONSTANT SCORE INCREASED SIGNIFICANTLY WHEN

COMPARE TO PRE OP WHICH INDICATE BETTER OUTCOME WITH THE TREATMENT

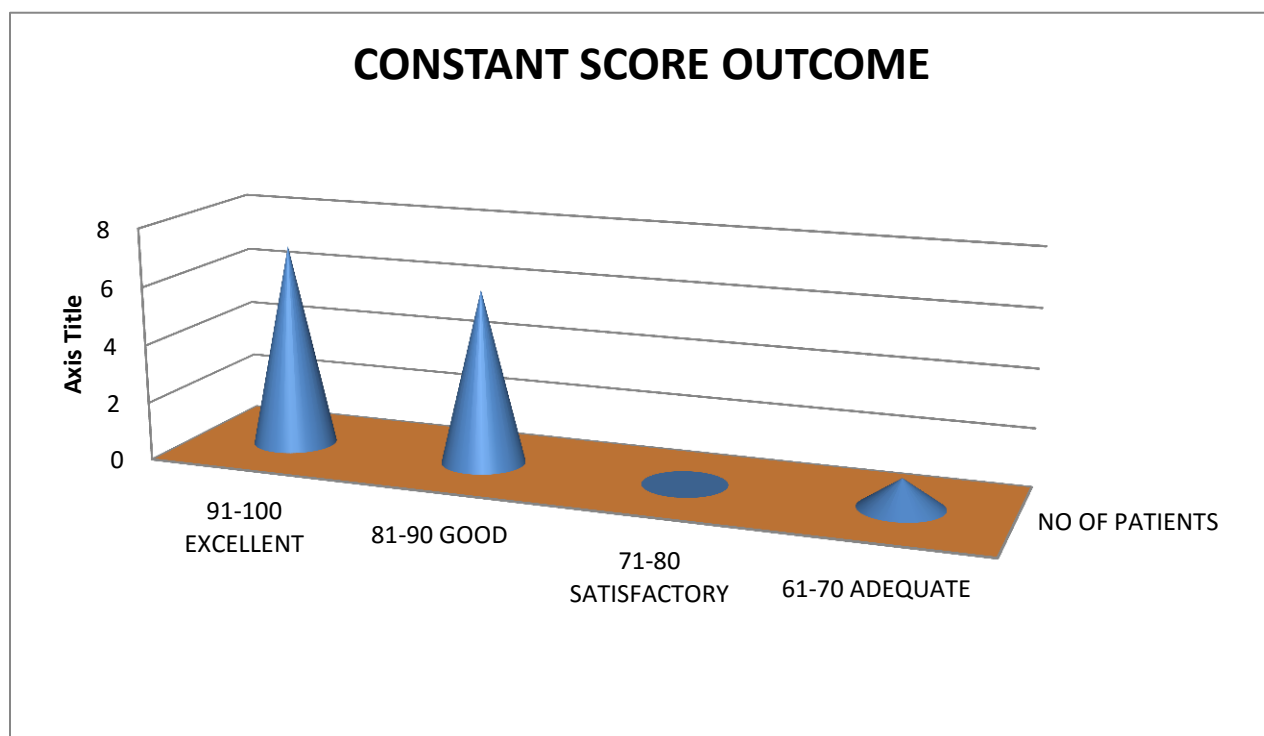
SCORE	PRE OP CONSTANT SCORE	POST OP CONSTANT SCORE
PALANI	15	92
PANDIYARAJ	17	88
KUZHANDAIRAJ	10	84
MADURAI VEERAN	17	94
KUMAR	19	89
JOHN PAUL	10	96
ANANDHA MURUGAN	21	94
GNANESWARAN	17	92
SENNIYAMMAL	21	84
VINOTH KUMAR	19	91
MALLIGA	10	63
MUTHUPANDI	21	89
BATHMANABAN	19	90
PARTHIBAN	19	80



### CONSTANT SCORE OUTCOME ASSESMENT:

In post op constant score assessment 7 patients had excellent outcome 6 patients had good outcome 1 patient had adequate out come

SCORE	NO OF PATIENTS
91-100 (EXCELLENT)	7
81-90 (GOOD)	6
71-80 (SATISFACTORY)	0
61-70 (ADEQUATE)	1



**CASE 1**

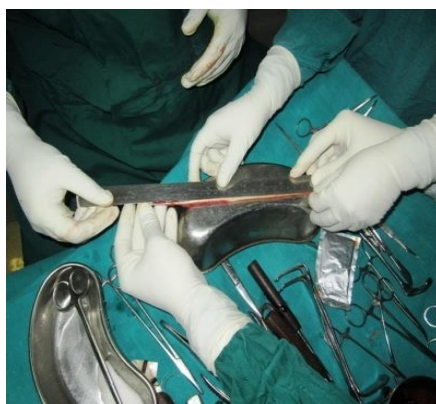
S. NO 6

**NAME: JOHN PAUL****AGE/SEX: 35/M****IP.NO:7021****DIAGNOSIS: ACROMIOCLAVICULAR JOINT DISRUPTION LEFT TYPE V**PRE OP CLINICAL  
PHOTO

PRE OP X RAY



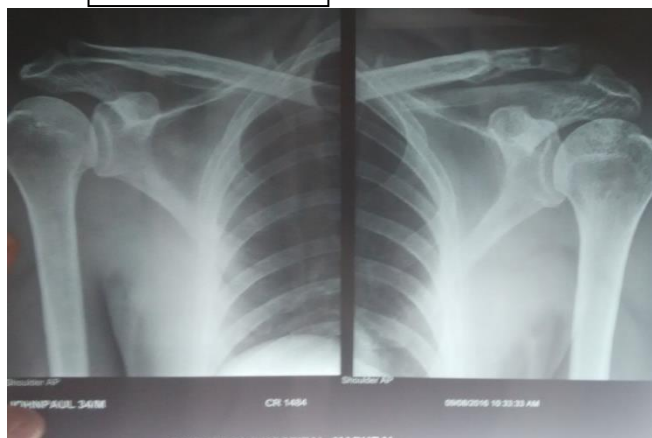
INTRA OP PICTURE



POST OP PICTURE



POST OP X RAY



FOLLOE UP CLINICAL PICTURE



PRE OP ASES SCORE : 15

PRE OP CONSTANT SCORE:10

POST OP ASES SCORE : 98.3

POST OP CONSTANT SCORE: 96

OUTCOME- EXCELLANT



**CASE 2**

S. NO 9

**NAME: SEENIYAMMAL**

**AGE/SEX:40/F**

**I.P.NO: 10671**

**DIAGNOSIS: ACROMIOCLAVICULAR JOINT DISRUPTION RIGHT  
TYPE III**

PRE OP PICTURE

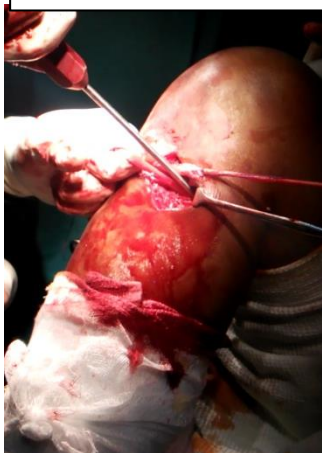


PRE OP X RAY –ZANCA VIEW

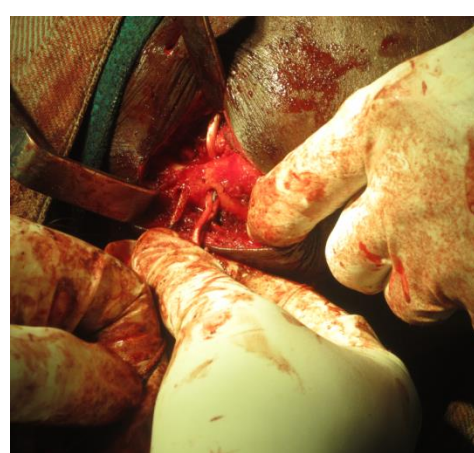
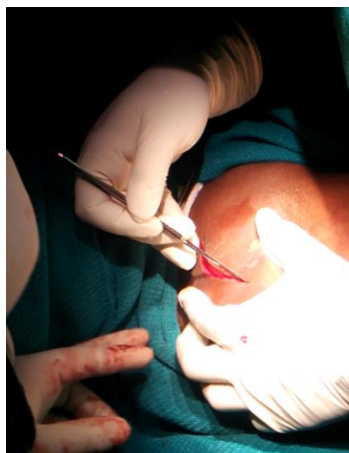


INTRA OP PICTURE

GRAFT HARVESTING



PROCEDURE



POST OP PICTURE



POST OP X RAY



FOLLOE UP X RAY



FOLLOE UP CLICAL PICTURE



## MOVEMENTS



PRE OP ASES SCORE : 15

PRE OP CONSTANT SCORE: 21

POST OP ASES SCORE : 88.3

POSTOP CONSTANT SCORE: 84

OUTCOME-GOOD

CASE-3

S. NO 12

**NAME: MUTHUPANDI****AGE/SEX:37/M****I.P.NO: 12564****DIAGNOSIS: ACROMIOCLAVICULAR JOINT DISRUPTION RIGHT  
TYPE III**

PRE OP PICTURE

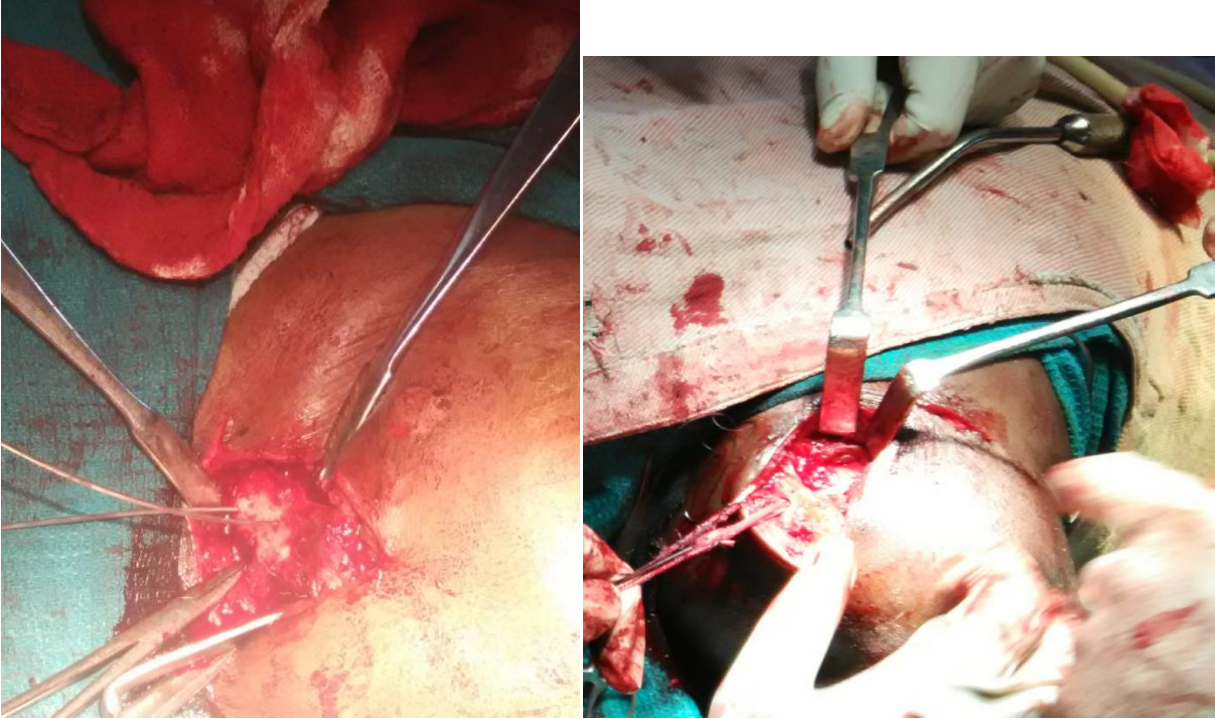


PRE OP X RAY –ZANCA VIEW

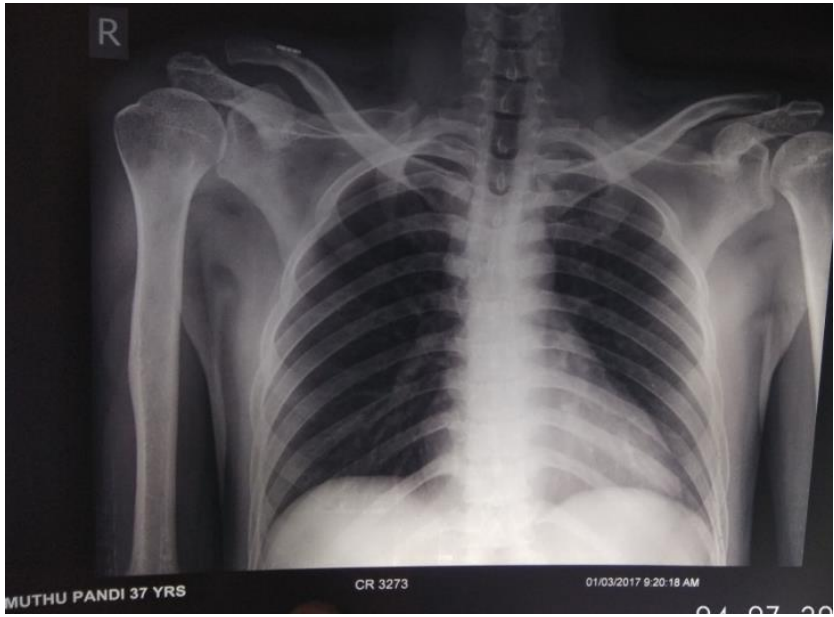


GRAFT PREPARATION

PROCEDURE



POST OP X RAY



MOVEMENTS



PRE OP ASES SCORE : 26.6

PRE OP CONSTANT SCORE: 21

PRE OP ASES SCORE : 93.3

PRE OP CONSTANT SCORE: 89

**OUTCOME : GOOD**

**CASE 4**

S. NO 2

**NAME: PANDIYARAJAN****AGE/SEX:33/M****I.P.NO: 00361****DIAGNOSIS: ACROMIOCLAVICULAR JOINT DISRUPTION LEFT****TYPE III**

PRE OP X RAY



INTRA OP PICTURE



POST OP PICTURE



POST OP X RAY



MOVEMENTS



PRE OP ASES SCORE : 23.3  
PRE OP CONSTANT SCORE: 17

PRE OP ASES SCORE : 84.9  
PRE OP CONSTANT SCORE: 88

OUTCOME : GOOD

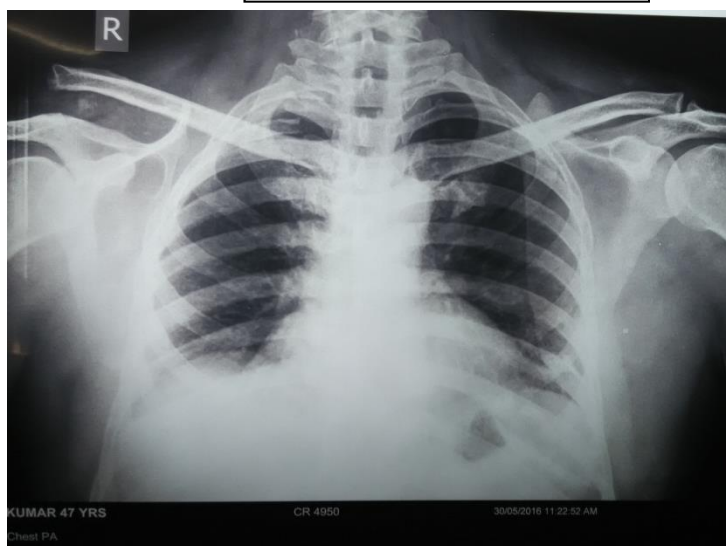


CASE 5

S. NO 5

**NAME: KUMAR****AGE/SEX:47/M****I.P.NO: 8890****DIAGNOSIS: ACROMIOCLAVICULAR JOINT DISRUPTION RIGHT****TYPE III**

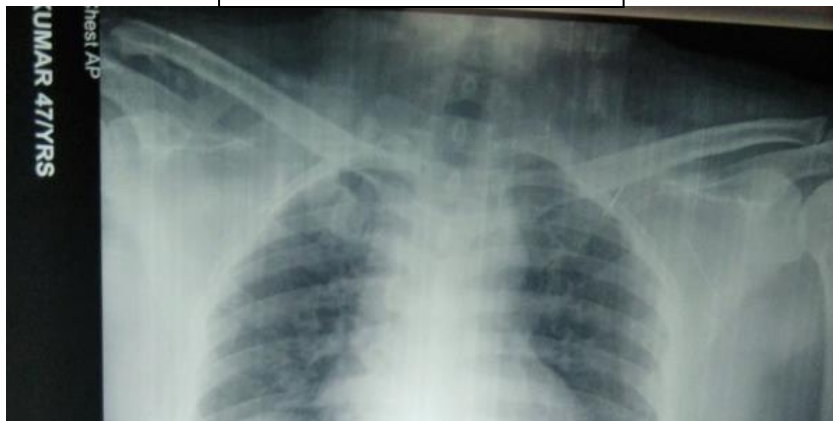
PRE OP X RAY



POST OP X RAY



FOLLOW UP X RAY



MOVEMENTS



PRE OP ASES SCORE : 23.3  
PRE OP CONSTANT SCORE: 19

POST OP ASES SCORE : 96.6  
POST OP CONSTANT SCORE:89

**OUTCOME: GOOD**

**CASE :6**

S. NO 1

**NAME: PALANI**

**AGE/SEX:60/M**

**I.P.NO: 17654**

**DIAGNOSIS: ACROMIOCLAVICULAR JOINT DISRUPTION RIGHT  
TYPE III**

PRE OP PICTURE



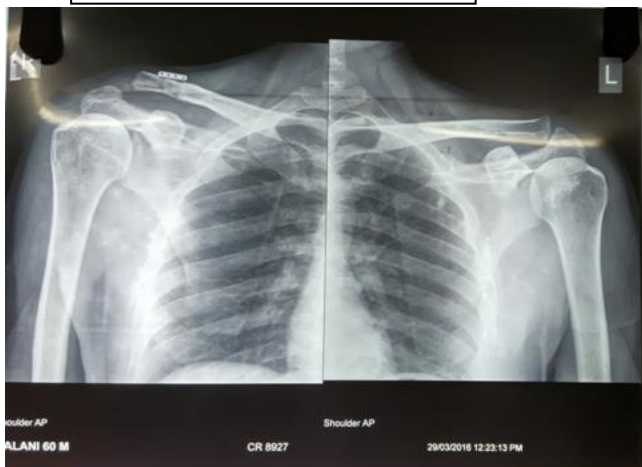
PRE OP X RAY



INTRA OP PICTURE



POST OP X RAY



POST CLINICAL PICTURE



76

MOVEMENTS



PRE OP ASES SCORE : 18

PRE OP CONSTANT SCORE: 15

POST OP ASES SCORE : 88.3

POST OP CONSTANT SCORE: 92

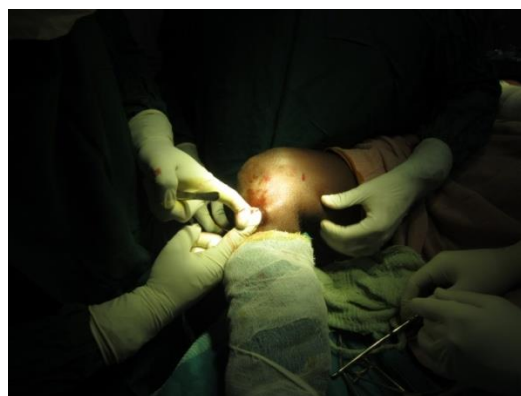
**OUTCOME    EXCELLENT**

**CASE 7**

S. NO 7

**NAME: ANANDHA MURUGAN****AGE/SEX:30/M****I.P.NO: 8922****DIAGNOSIS: ACROMIOCLAVICULAR JOINT DISRUPTION****RIGHTTYPE III**

PRE OP X RAY



INTRA OP PICTURE

## POST OP X RAY



## MOVEMENTS



PRE OP ASES SCORE : 20

PRE OP CONSTANT SCORE: 21

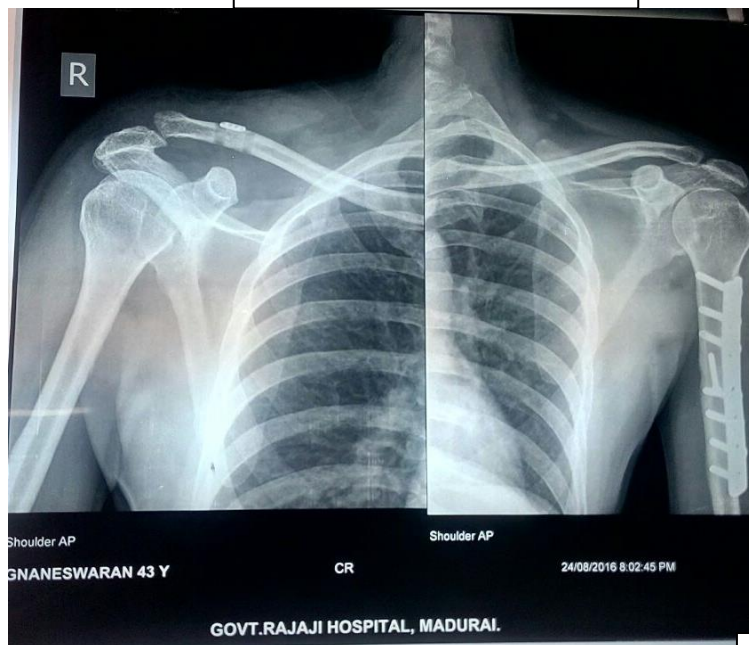
POST OP ASES SCORE : 98.3

POST OP CONSTANT SCORE: 94

**OUTCOME: EXCELLENT**

**CASE :8****S. NO 8****NAME: GNANESWARAN****AGE/SEX:43/M****I.P.NO: 9769****DIAGNOSIS: ACROMIOCLAVICULAR JOINT DISRUPTION RIGHT  
TYPE III****PRE OP X RAY****INTRA OP PICTURE**

POST OP PICTURE



MOVEMENTS



PRE OP ASES SCORE : 25  
PRE OP CONSTANT SCORE: 17

PRE OP ASES SCORE : 84.9  
PRE OP CONSTANT SCORE: 92

**OUTCOME: EXCELLANT**



**CASE:9**

S. NO 3

**NAME: KULANTHAIRAJ**

**AGE/SEX:27/M**

**I.P.NO: 2242**

**DIAGNOSIS: ACROMIOCLAVICULAR JOINT DISRUPTION LEFT  
TYPE III**

PRE OP X RAY



INTRA OP PICTURE



POST OP X RAY



MOVEMENTS



PRE OP ASES SCORE : 15

PRE OP CONSTANT SCORE: 10

PRE OP ASES SCORE : 93.3

PRE OP CONSTANT SCORE: 90

**OUTCOME: EXCELLANT**

**COMPLICATIONS:**

**CASE: 1**

S. NO 11

**NAME: MALLIGA**

**AGE/SEX:46/F**

**I.P.NO: 11856**

**DIAGNOSIS: ACROMIOCLAVICULAR JOINT DISRUPTION LEFT**

**TYPE III**

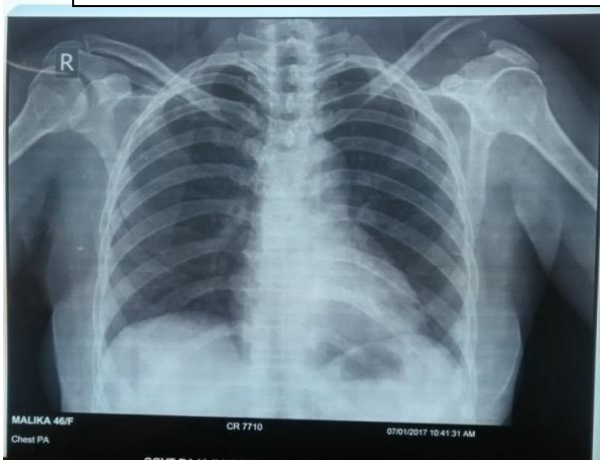
PRE OP PICTURE



PRE OP X RAY



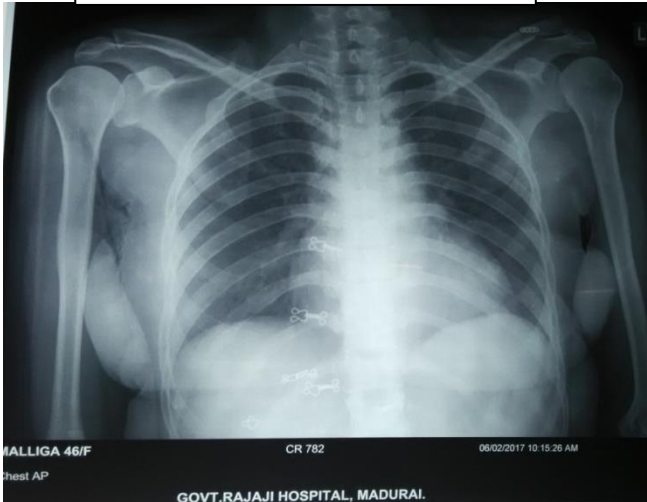
PRE OP X-RAY ZANCA VIEW & AXILLARY VIEW



INTRA OP PICTURE



POST OP X-RAY



WOUND INFECTION



MOVEMENTS



PRE OP ASES SCORE : 18  
PRE OP CONSTANT SCORE: 10

POST OP ASES SCORE : 68.3  
PRE OP CONSTANT SCORE: 63

COMPLICATION:

SUPERFICIAL INFECTION & RESTRICTED RANGE OF MOVEMENTS

OUTCOME: ADEQUATE

CASE:2

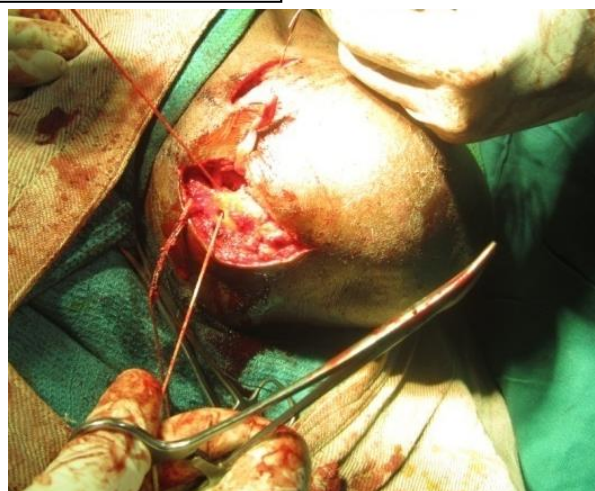
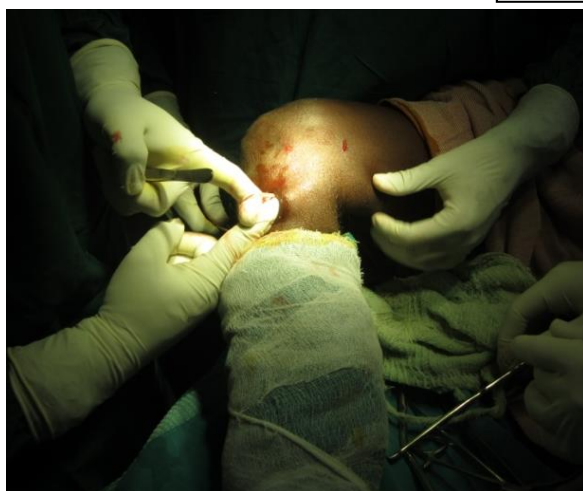
S. NO 4

**NAME: MADURAI VEERAN****AGE/SEX:36/M****I.P.NO: 7664****DIAGNOSIS: ACROMIOCLAVICULAR JOINT DISRUPTION RIGHT****TYPE III**

PRE OP X RAY



INTRA OP PICTURE



FOLLOW X RAY

POST OP X RAY



POST OP PICTURE & MOVEMENTS



PRE OP ASES SCORE : 25  
PRE OP CONSTANT SCORE: 17



PRE OP ASES SCORE : 94.9  
PRE OP CONSTANT SCORE: 94

LOSS OF AC JOINT REDUCTION IN POST OP FOLLOW UP  
FUNCTIONAL OUTCOME : EXCELLANT

**RESULTS:**

Total no of acromioclavicular joint disruption type III to type VI patients admitted in our hospital was 22 patients out of which 4 patients were not willing for surgery and 3 patients had associated injuries and one was not assessed due to respiratory complication hence they were excluded from study . 14 patients were operated with this procedure out of which 12 male & 2 female patients . Its shows the prevalence is increased among male patients.

Age of the patient ranges from 26-60 years with the mean age of 39 years. Among 14 patients studied 57% (8) of patients were 20-40 years of age .It shows increased incidence among in younger population when compare to older population .

In my study 10 patients were affected on Right side and 4 patients were on left side .Right sided involvement is more in my study. Mode of injury is more with road traffic accident(57%).

Average blood loss during the procedure was 258ml(range 230-285ml)and the mean operating time was 138mins(range 115-165mins).



Post operative rehabilitation was started according to the protocol. All the patients were followed up to 1 year at regular 3 months interval to assess the functional and radiological outcome.

Functional outcome by ASES score and constant score .Radiological outcome by taking zanca view to asses the amount of reduction and to rule out clavicle or coracoid fracture .

ASES score is 100 point score , 50 points for pain using VAS(visual analogue scale)and 50 points for functional assessment with 10 questionnaire related daily activities .The raw score is multiplied by a coefficient. Pain subscore is multiplied by 5 and functional sub score is multiplied by 5/3 .Higher the score better is the outcome.

Constant score is 100 piont score in which 15 points for pain ,20 points for ADL(Activities of daily living), 40 points for ROM ,25 points for power to asses shoulder function. Constant score of 91-100 graded as excellent, 81-90 as good, 71-80 as satisfactory and 61–70 as adequate outcome. Average ASES score was 90 (range68.3-98.3)and constant score was 88(range63-96) .

According to constant score 7 patients had excellent outcome, 6patients had good outcome, one patient had adequate outcome . Minimal loss of

reduction was present in one patient and none of the patients had clavicle or coracoids fractures in my study .

Total complications 4 .one had donor site complication and 2patients with surgical site complication and one patient has restricted range of motions . One patient complaints of knee pain while walking and it resolved with due course of time . One patient had paresthesia over surgical site for 3 months and she recovered fully in the next follow-ups. One patient had superficial infection over the surgical site and treated with antibiotics .The infection was settled in the next follow-ups and the same patient had restricted range of movements , finally she achieved up to 100 degrees of shoulder abduction after physiotherapy.

### **Discussion :**

Acromioclavicular joint disruption accounts for 9% of all shoulder abnormalities it is most commonly seen in young athletes who are participating in contact sports. In low grade injuries type I type II injuries are most common and it is most commonly treated by conservative measures with Jone's strapping and ice application. Surgical treatment for type III ac joint injuries are controversial . Some authors suggests conservative and some prefers surgical treatment .Nevaiser et al,proposed a classification system to plan the treatment for type III acromioclavicular injuries in that if the ac joint reduces with upward pressure

conservative treatment can be advised if ac joint is not reduced with upward pressure surgical treatment is preferred. Rockwood type IV to Type VI injuries are high grade injuries in which acromioclavicular coracoclavicular ligaments disruptions associated with button holing into trapezius or tear of deltoid , trapezius,or clavicular displacement to the undersurface of biceps tendon may occur. But in our study all type III to Type VI injuries were included .

Out of 22 patients of type III to Type VI injuries 4 patients were not willing for surgery with semitendinosus graft ,3 patients had associated clavicle and neck of scapula fractures and one patient of rockwood type III was not assessed due to lower respiratory infection and COPD. All these patients were excluded from the study. Total of 14 patients were underwent surgery with this technique .

For radiographic evaluation Zanca et al, described a special view which is followed in our study in which chest x ray with both shoulders was taken with 10degrees cephalic tilt . This view helps to unmask the coracoclavicular overshadow and to asses the coracoclavicular distance. Axillary view was used to asses the posterior displacement.

All the patients were operated only after obtaining informed consent . 6 patients were operated under General anaesthesia and 8 patients were operated

under intersclenae ,paravertebral block and spinal anaesthesia for graft harvesting .In beach chair position , through robert approach curved incision made from the acromion to coracoid .skin subcutaneous tissue incised and retracted. Skeletonization of clavicles done by elevating flaps from deltoid and trapezius. Xue et al conducted a study to asses the anatomic land mark of conoid and trapezoid ligament and he measured the distance from the acromion with this reference we made conoid and trapezoid tunnels. Conoid tunnel was made posterior and medial at the junction of middle and lateral third of clavicle (4.5cm from acromion ) and trapezoid tunnels was made 1 cm anterior and lateral to the previous tunnel .These tunnels were nearly anatomical to the native foot print of coraco clavicular ligaments.

The allograft choice for ligament reconstruction is increased nowadays but we preferred semitendinosus autograft for reconstruction. Length of around 110 to 220mm of graft was harvested and the tendon was augmented with no 5 ethibond and tied at the ends in order to increase the strength and easy passage of the tendon into the tunnels. Mazzocca et al& E Stephen et al , reconstruct the ac joint with semitendinosus graft & interferential screws. In my study a non absorbable suture(no 5 ethibond) passed through tunnels along with the graft and fixed with endobutton to secure primary reduction .None of my patients reported with clavicle or coracoids fracture. Excess limb of the graft is used to reconstruct the

acromioclavicular ligaments. None of the patients received blood transfusion and post operative ventilatory care .

Post operative rehabilitation done according to the protocol. Patients were followed up to one year to asses the pain, range of movements and zanca view taken to asses the reduction ASES score and constant score were used to asses the outcome .Erriksson et al , conducted MRI study to asses the regeneration of semitendinosus tendon after harvesting it shows the signal intensity below the joint line but we have not conducted any MRI study to asses the regeneration .

#### ADVANTAGES:

1)Construct is more biological.2)Reconstruction of both acromioclavicular and coracoclavicular ligaments.                      3 )Preserves coracoacromial ligament.

4)Augmentation with ethibond gives strength and stiffness similar to that of intact ligament.

5)Augmentation enables to shield the repair and reconstruction from extensive tensile force while allowing physiological motion between clavicle and coracoids

6)Endobutton avoids the stress concentration over the bone bridge between the two tunnels.

7)Coracoids is not drilled so coracoids fracture like complications avoided

## .CONCLUSION

Acromioclavicular joint disruption type III-type VI reconstruction by using autogenous semi tendinosus graft with Endo button .Strength of the semitendinosus graft is similar to the coracoclavicular ligaments .Reconstruction of both acromioclavicular and coracoclavicular ligaments is done to recreate the near normal anatomy of ac joint. Two tunnel created according to the position of the coracoclavicular ligaments and coracoids is not drilled instead of that the graft is passed under the coracoid without disturbing the conjoint tendon Endobutton and Ethibond is used to secure primary reduction.Excess limb of the graft is fixed to the acromian to recreate the acromioclavicular ligaments.

Construct is more biological,Reconstruction of both acromioclavicular and coracoclavicular ligaments,Preserves coracoacromial ligament,Augmentation with ethibond gives strength and stiffness similar to that of intact ligament,Augmentation enables to shield the repair and reconstruction from extensive tensile force while allowing physiological motion between clavicle and coracoids,Endobutton avoids the stress concentration over the bone bridge between the two tunnels,Coracoids is not drilled so coracoids fracture like complications avoided,Distal clavicle osteotomy prevents early degenerative osteoarthritic changes and osteolysis .

From this study I conclude that biological reconstruction with autogenous semitendinosus graft provides near normal anatomical reconstruction of Acromioclavicular joint with ligament complex(AC&CC) with better stability and mobility.

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**STUDY PROFORMA:**

TO ASSES THE FUNCTIONAL OUTCOME OF ACROMIOCLAVICULAR  
LIGAMENT RECONSTRUCTION USING SEMITENDINOSUS GRAFT

NAME – :

AGE/SEX- : OCCUPATION:

IP NO :

ADDRESS :

MOBILE NO :

MODE OF INJURY :

DIAGNOSIS – :

PROCEDURE- :

DATE OF ADMISSION- :

DATE OF SURGERY- :

DATE OF DISCHARGE- :

Pre op ASES SCORE :

Pre op CONSTANT SCORE :

OPERATIVE TIME :

AMOUNT OF BLOOD LOSS:

POST OP PERIOD :

	PRE OP	POST OP	1 MONTH	3 MONTH	6MONTH	12 MONTH
ASES SCORE						

COMPLICATIONS()-:

DONOR SITE :

SURGICAL SITE :

ASST PROF SIGN :

UNIT CHIEF :

CO GUIDE

GUIDE :

**Consent form**

**FOR OPERATION/ANAESTHESIA**

I \_\_\_\_\_ Hosp. No. \_\_\_\_\_ in my full senses hereby give my full consent for \_\_\_\_\_ or any other procedure deemed fit which is a diagnostic procedure / biopsy / transfusion / operation to be performed on me / my son / my daughter / my ward \_\_\_\_\_ age under any anaesthesia deemed fit. The nature, risks and complications involved in the procedure have been explained to me in my own language and to my satisfaction. For academic and scientific purpose the operation/procedure may be photographed or televised.

Date:

Signature/Thumb Impression

Name of Patient/Guardian:

Designation

Guardian Relation ship

Full address



## MASTER CHART

S.NO	NAME	AGE	SEX	IP.NO	TYPE	SIDE	Preop ASES score	Preop CONSTANT score	OPER ATIVE TIME	BLOOD LOSS(ML )	POSTop ASES score	POST OP CONSTANT SCORE
1	PALANI	60	M	17654	III	RIGHT	18	15	160	255	88.3	92
2	PANDIYARAJ	33	M	00361	III	RIGHT	23.3	17	140	240	84.9	88
3	KUZHANDAIRAJ	27	M	2242	III	LEFT	15	10	140	250	93.3	84
4	MADURAI VEERAN	36	M	7664	III	RIGHT	25	17	165	280	94.9	94
5	KUMAR	47	M	8890	III	RIGHT	23.3	19	130	285	96.6	89
6	JOHN PAUL	35	M	8769	V	LEFT	15	10	120	265	98.3	96
7	ANANDHA MURUGAN	30	M	8922	III	RIGHT	20	21	115	230	98.3	94
8	GNANESWARAN	43	M	9769	III	RIGHT	25	17	125	245	84.9	92
9	SENNIYAMMAL	40	F	10112	III	RIGHT	15	21	145	275	88.3	84
10	VINOTH KUMAR	26	M	11234	III	RIGHT	26.6	19	135	245	93.3	91
11	MALLIGA	46	F	11856	III	LEFT	18	10	155	280	68.3	63
12	MUTHUPANDI	37	M	12564	III	RIGHT	26.6	21	135	260	93.3	89
13	BATHMANABAN	56	M	12879	III	LEFT	18	19	140	255	88.3	90
14	PARTHIBAN	28	M	13245	III	RIGHT	15		130	240	94.9	80



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**ETHICS COMMITTEE  
 CERTIFICATE**

Name of the Candidate : Dr.R.Muthusamy

Course : PG in MS., Orthopaedics

Period of Study : 2015-2018

College : MADURAI MEDICAL COLLEGE

Research Topic : A study on analysis of  
 functional outcome of  
 biological reconstruction of  
 acromioclavicular joint injuries

Ethical Committee as on : 17.03.2017

The Ethics Committee, Madurai Medical College has decided to inform  
 that your Research proposal is accepted.

*H. Shan*  
 Member Secretary

*V. Nagaraajan*  
 Chairman  
 M.D., MNAMS, D.M., Dsc.(Neuro), Dsc (Hon)  
 CHAIRMAN  
 IEC - Madurai Medical College  
 Madurai

*S. Shan*  
 Dean / Convenor  
 DEAN  
 Madurai Medical College  
 Madurai-20



## Urkund Analysis Result

**Analysed Document:** biological reconstruction of Acromioclavicular JOINT endobutton - Copy-2.docx (D31483901)  
**Submitted:** 10/20/2017 4:41:00 AM  
**Submitted By:** muthuramki85@gmail.com  
**Significance:** 4 %

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<http://drmillett.com/wp-content/uploads/articles/Complications%20after%20acromioclavicular%20joint%20reconstruction.pdf>  
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<https://link.springer.com/article/10.1007/s10195-013-0242-2>

Instances where selected sources appear:

16

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### **ABBREVIATION:**

**AC JOINT** – ACROMIOCLAVICULAR JOINT

POD – Post Operative Day

ASES – American shoulder elbow surgeons score