FUNCTIONAL OUTCOME OF SURGICAL CORRECTION OF ACROMIOCLAVICULAR JOINT DISRUPTION OF TYPE III TO VI

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GOVT MOHAN KUMARAMANGALAM MEDICAL COLLEGE

THE TAMILNADU DR. M.G.R MEDICAL UNIVERSITY

CHENNAI, INDIA

MAY 2020

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This is to certify that this dissertation entitled **" FUNCTIONAL OUTCOME OF SURGICAL CORRECTION OF ACROMIOCLAVICULAR JOINT DISRUPTION OF TYPE III TO VI"** Which is being submitted for **M.S. ORTHOPAEDICS,** is a bonafide work of **Dr. G. SIVARAMAN,** Post graduate student of the Department of Orthopaedics, Govt. Mohan Kumaramangalam Medical College Hospital, Salem, during the academic year 2017 -2020.

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I, **Dr. G. SIVARAMAN**., solemnly declare that this dissertation titled **"FUNCTIONAL OUTCOME OF SURGICAL CORRECTION OF ACCROMIOCLAVICULAR JOINT DISRUPTION OF TYPE III TO** VI**"** is a bonafide work done by me at Govt Mohan Kumaramangalam Medical College, Salem from November 2017 onwards under the guidance and supervision of **Prof. C. KAMALANATHAN M.S.ORTHO, D.ORTHO**, Professor and Head of the Department, Department of Orthopaedics, Govt Mohan Kumaramangalam Medical College, Salem.

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ABSTRACT

The Acromioclavicular joint disruptions accounts for about 12% of shoulder injuries. The Acromioclavicular joint plays a pivotal role in glenohumeral abduction over 90^0 associated with scapulothoracic motion .Type I and II are managed conservatively. Type III to VI needs reconstruction of coracoclavicular and acromioclavicular ligaments which are the primary stabiliser of acromioclavicular joint. Various methods of reconstruction had been followed .But very limited literature is available in providing which method is most effective ,least morbidity and better range of movements. In our study we have compared endobutton flip technique ,suture anchor and hamstring graft.24 patients were admitted 8 patients were treated by each of the method above .All the 24 patients had good range of motion after surgery in one year follow up. The methods were assessed using constant shoulder score.

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LIST OF ABBREVIATIONS

AC JOINT- ACROMIOCLAVICULAR JOINT

ACJ INJURIES- ACROMIOCLAVICULAR JOINT

SC JOINT- STERNOCLAVICULAR JOINT

AC LIGAMENT- ACROMIOCLAVICULAR LIGAMENT

CC LIGAMENT - CORACOCLAVICULAR LIGAMENT

SC LIGAMENT - STERNOCLAVICULAR LIGAMENT

HBSAG- HEPATITIS B SURFACE ANTIGEN

HIV- HUMAN IMMUNODEFICIENCY VIRUS

ECG- ELECTROCARDIOGRAM

RTA- ROAD TRAFFIC ACCIDENT

MTS- MONTHS

ABD- ABDUCTION

ROM – RANGE OF MOVEMENTS

INTRODUCTION

The Acromioclavicular joint dislocations are common among the athletic population. They account for approximately[4] 12% injuries of the shoulder girdle. These injuries occur commonly in males in second to fifth decade age group seen in motor vehicle collision accidents

The Diarthrodial acromioclavicular joint and its soft tissue supports allow the clavicle to fulfill its role as an osseous stabilisation bar helping to maintain lateralisation of scapula on chest wall. ACJ injuries usually occurs as a result of direct fall onto the top of the shoulder while the arm is adducted or with a direct blow over the shoulder.

The management of these injuries has been started since the time of Hippocrates and Galen, but there still appears to be no consensus regarding when operative management is necessary and which procedure produces the best functional outcome with the least morbidity[2].

Numerous procedures have been described for the operative management of acromioclavicular joint injuries, but Surprisingly little information is available on the ultimate mechanical behavior of the native coracoclavicular ligament complex or on the various methods of reconstruction.

There is a lack of evidence to support treatment options for patients with AC joint dislocations. Although there is a general consensus for nonoperative treatment of Rockwood Type I and II lesions, initial nonsurgical treatment of type III lesions and

operative intervention for Rockwood type IV to VI lesions, further research is needed to determine if Differences exist regarding early versus delayed surgical intervention and anatomic versus nonanatomic surgical techniques in the treatment of patients with AC joint dislocations.

AIM OF THE STUDY

Functional outcome of surgical correction of acromioclavicular joint Disruption of Type III to VI treated by open reduction and reconstruction with suture anchor & eight plate technique, open reduction and reconstruction with endobutton flip technique, open reduction & reconstruction with hamstring graft technique.

REVIEW OF LITERATURE

There are various methods of treatment were practised in the past for acromio clavicular joint disruptions.

Hippocrates the father of medicine has managed ac joint disruptions with tight bandages to hold the projecting clavicle down while keeping the arm elevated.

"Galen[1] (129–199 AD) famous Greeco-Roman physician had diagnosed his own AC dislocation injured from wrestling in the Palaestra. He treated himself with tight bandages to hold the projecting clavicle down while keeping the arm elevated.

The surgical treatment of AC joint injuries has evolved and demonstrates a clear historical progression. The Biomechanics of AC joint has been better understood.

"Samuel Cooper is given credit for the surgical management of a displaced, painful AC joint dislocation in 1861[5].

"In 1917, Cadenat[6] described transfer of the coracoacromial ligament, a procedure later popularized by Weaver and Dunn."

Over last 10 to 15 years there has been an increase in the number of publications of surgical treatment of AC joint dislocations with repairs or reconstruction procedures.

The rapid progression of orthopaedic implant technology has led to the application of improved surgical techniques and strategies. Open reconstruction techniques aims to reduce the AC joint to an anatomic position.

This can be accomplished using traditional methods that provide a very rigid construct or a more anatomic approach, in which goal is to provide reconstruction of three dimensional function of AC joint complex.

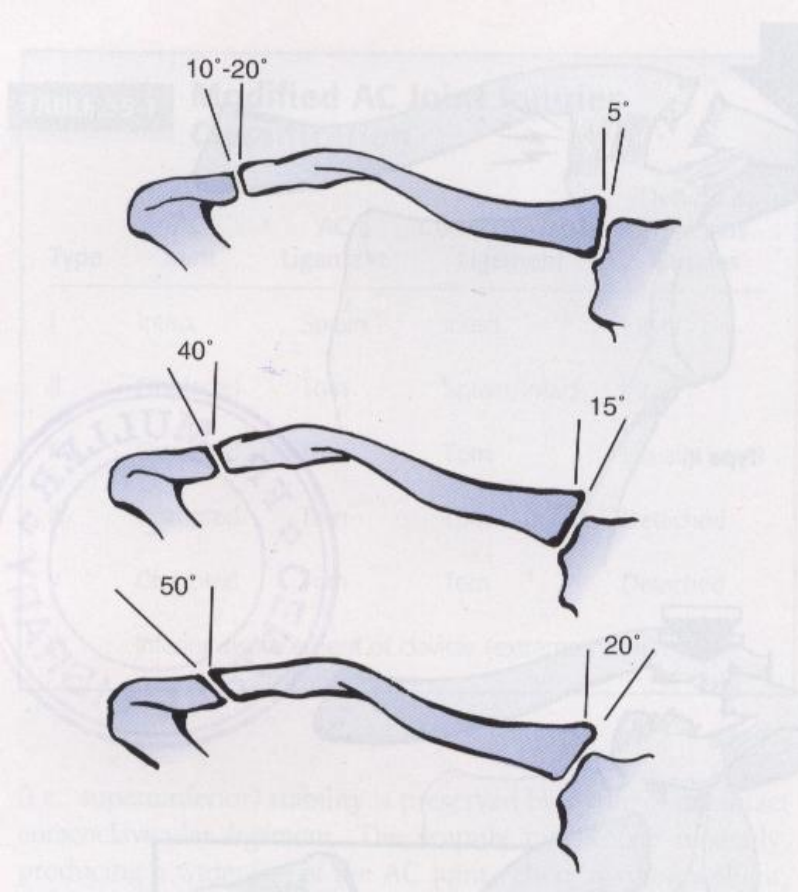
The gold standard method for surgical surgical stabilisation of acute, painful AC joint dislocation has yet to be established.

ANATOMY

Ac joint [3] is a diarthrodial joint with fibrocartilaginous disk of varying size & shape located between medial margin of acromion and lateral end of clavicle.

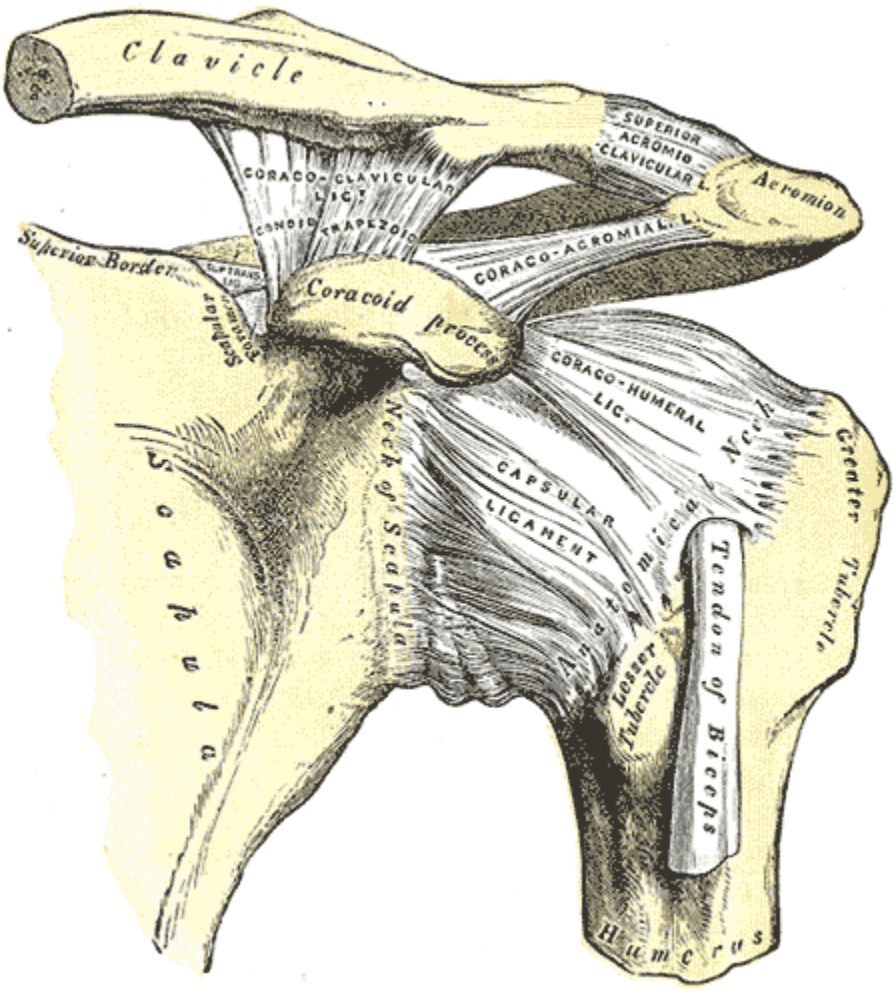
Ac joint composed of complete & partial (meniscoid) intraarticular disk & with age meniscus undergoes degeneration[8].

In Anteroposterior direction Ac joint may be inclined vertically or with clavicle overriding the acromion by 50 degree angulation inclined medially and downward[7].



Articulating surfaces inclination are important for biomechanical support & considered when surgical repair or reconstruction is performed.

Three main ligaments stabilise the joint Acromioclavicular ligament which provides horizontal stability and Coracoclavicular and Coracoacromial ligaments which provides vertical stability.

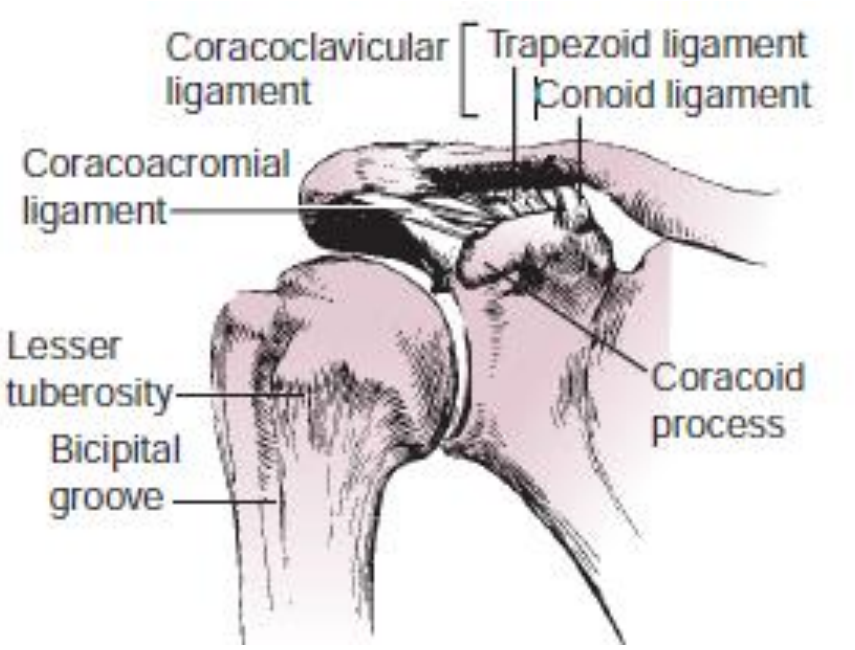


The muscle attachments deltoid and trapezius blend with capsule adding stability to ac joint.

ACROMIOCLAVICULAR LIGAMENTS;

Ac ligaments consist of superior, inferior, anterior & posterior ligaments surrounds the Ac joint. Superior Ac ligaments which are the strongest which are blend with fibres of deltoid & trapezius muscles which are attached to superior aspect of clavicle & acromion process. Ac ligament provides horizontal stability to AC joint[9].

CORACOCLAVICULAR LIGAMENTS;



Coracoclavicular Ligament is a very strong outer inferior surface of the clavicle to the base of coracoid process of scapula.

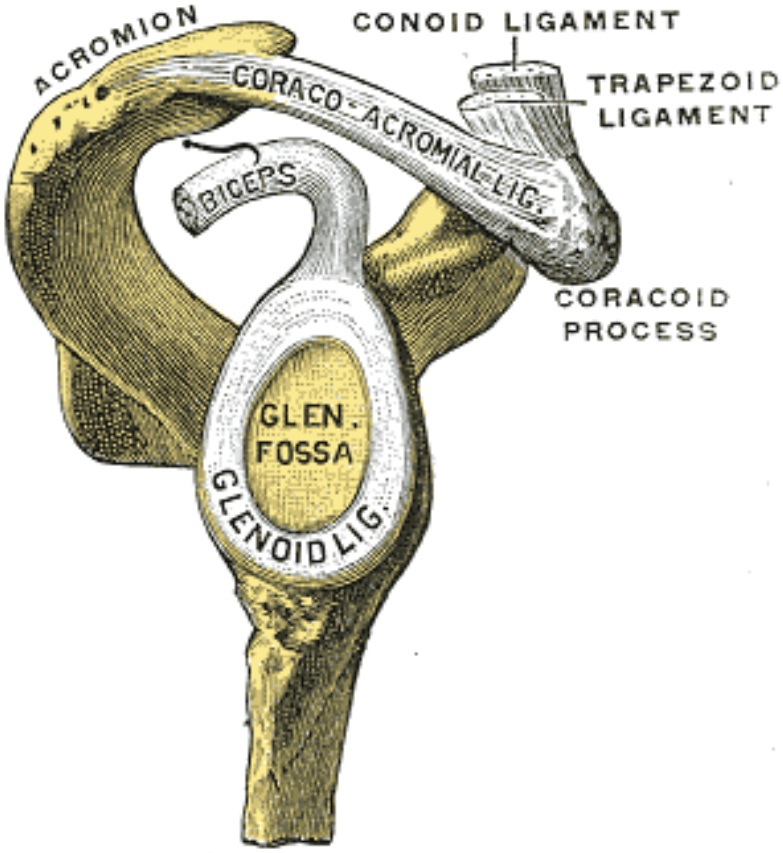
CC ligament has two components conoid & trapezoid ligaments.

The trapezoid ligament measures from 0.8-2.5cm in length and width. Trapezoid ligament arises from anterior and lateral to conoid ligament from coracoid process to undersurface of clavicle

The conoid ligament varies from 0.7-2.5cm in length and 0.4-0.9cm in width[10] .The cone shaped conoid medial ligament attached conoid tubercle undersurface of clavicle to posteromedial side of base of coracoid process.

CORACOACROMIAL LIGAMENTS;

Strong triangular band that connects coracoid process to acromion and also provides vertical stability.

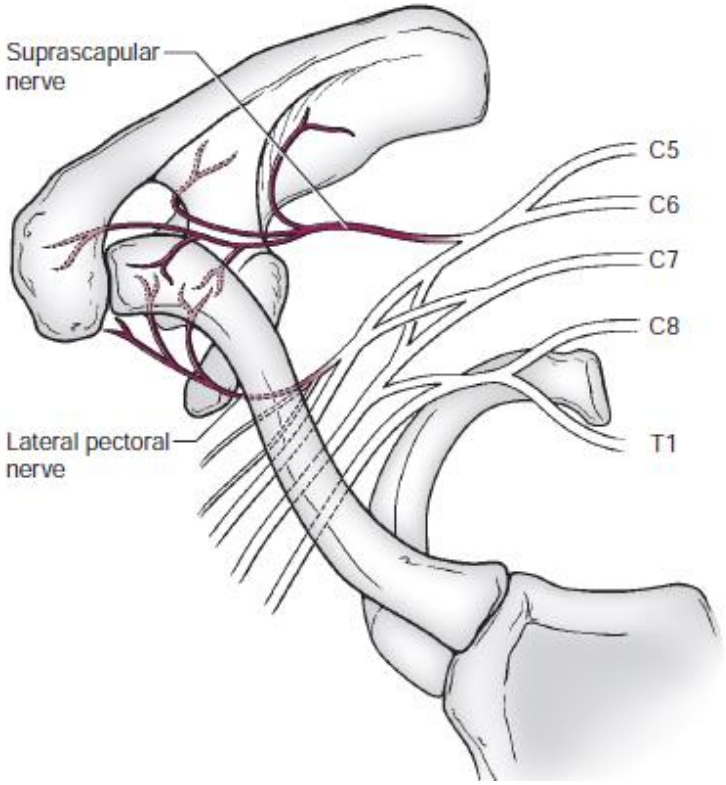


Blood supply;

Ac joint is supplied by Suprascapular and Thoracoacromial arteries.

Nerve supply;

Ac joint is supplied from branches of axillary, suprascapular & lateral pectoral nerves.



BIOMECHANICS[1]

The biomechanics of the AC joint involve static stability, dynamic stability, and AC joint motion. The only connection between the upper extremity and the axial skeleton is through the clavicular articulations at the AC and SC joints. Moreover, through anatomic dissections of the SC ligaments, he demonstrated how these ligaments prevent downward displacement of the distal end of the clavicle. Hence, in the erect position, the strong SC ligaments support the clavicles suspended away from the body, like the wings from the body of an airplane.

Furthermore, just as the jet engines are suspended from the underside of the wings, the upper extremities are suspended from the distal clavicles through the CC ligament. Thus the CC ligament is the prime suspensory ligament of the upper extremity.

AC joint stability is maintained predominantly by the surrounding ligamentous structures, specifically the CC ligaments (conoid and trapezoid) and the AC capsule and ligaments. The contribution of the AC, trapezoid, and conoid ligaments was determined at small and large displacements.

Fukuda et al [12] performed load displacement test with fixed displacement after sequential ligament sectioning to determine individual contributions of the various ligaments to AC stability.

At small displacements, the AC ligaments were the primary restraint to both posterior (89%) and superior (68%) translation of the clavicle the most common failure patterns seen clinically. At large displacements, the conoid ligament provided the primary restraint (62%) to superior translation, whereas the AC ligaments remained the primary restraint (90%) to posterior translation[11]. At both large and small displacements, the trapezoid ligament served as the primary restraint to AC joint compression.

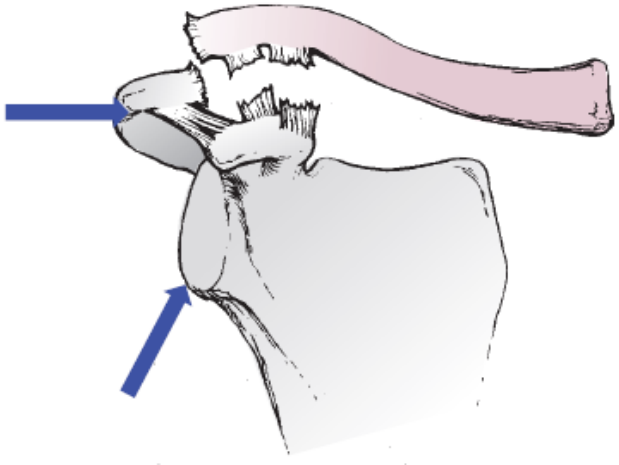
Posterior abutment of the clavicle against the acromion is avoided with only 5 mm of bone removal. This preserves the capsule and ligaments, maintaining AP stability of the AC joint. Larger resections have been shown to result in excessive posterior translation[13].

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[14]. As the clavicle rotates upward, it dictates scapulothoracic rotation by virtue of its attachment to the scapula—the conoid and trapezoid ligaments.

MOTION OF ACROMIOCLAVICULAR JOINT

The clavicle rotates superiorly 40 to 50 degrees with elevation of the shoulder. Although the clavicle rotates 40 to 50 degrees during full overhead elevation, this rotation is combined with simultaneous scapular rotation rather than with pure AC joint motion[15,16]. Dynamic process that happens with shoulder motion along entire length of clavicle with rotation and motion occurring at both SC and AC joint.

MECHANISM OF INJURY



Low grade ac joint disruptions result from falling on an outstretched arm, locked in extension at the elbow, force the humeral head superior into the acromion typically resulting in low-grade AC joint injuries . A medial directed force to the lateral shoulder that drives the acromion into and underneath the distal clavicle result in higher degrees of injury and subsequently more displacement[17].

One of the more commonly described patterns involves falling or being tackled onto the lateral aspect of the shoulder with the arm in an adducted position which produces a compressive (medial) and shear (vertical) force across the joint.

This typically produces a higher degree of displacement because the force is enough to disrupt both the AC and coracoclavicular (CC) ligaments.

PATHOPHYSIOLOGY

The injury force which drives the acromion medially and downward produces a progressive injury pattern; first disruption of the AC ligaments, followed by disruption of the CC ligaments,and finally disruption of the fascia overlying the clavicle that connects the deltoid and trapezius muscle attachments[18].

At this point, the upper extremity has lost its suspensory support from the clavicle and the scapula and associated glenohumeral articulation displaces inferiorly secondary to forces of gravity.

Although there may be a slight upward displacement of the clavicle from the pull of the trapezius muscle, the characteristic anatomic feature is actually inferior displacement of the shoulder and arm.

The mechanism of inferior dislocation of the clavicle under the coracoid is thought to be a very severe direct force onto the superior surface of the distal clavicle; along with abduction of the arm and retraction of the scapula[19].

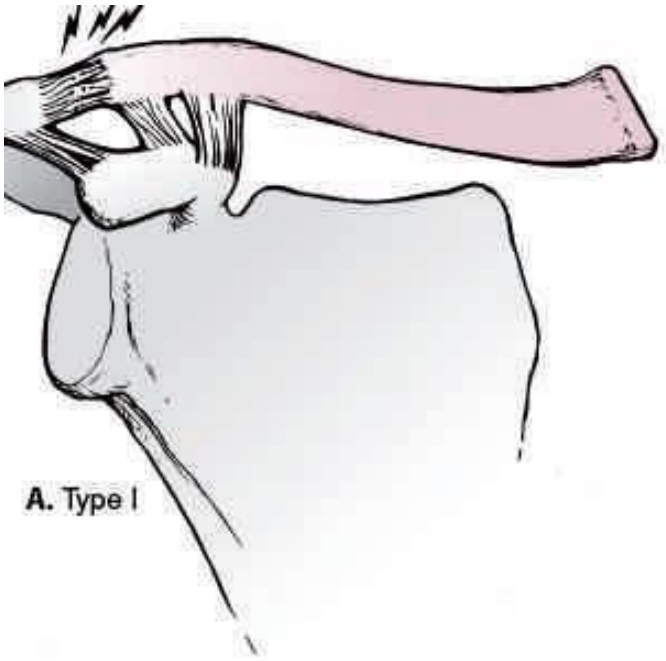
CLASSIFICATION

Ac joint injuries are best classified according to the extent of damage influenced by a given force. The strength of any classification system depends on its ability to guide treatment and predict prognosis.

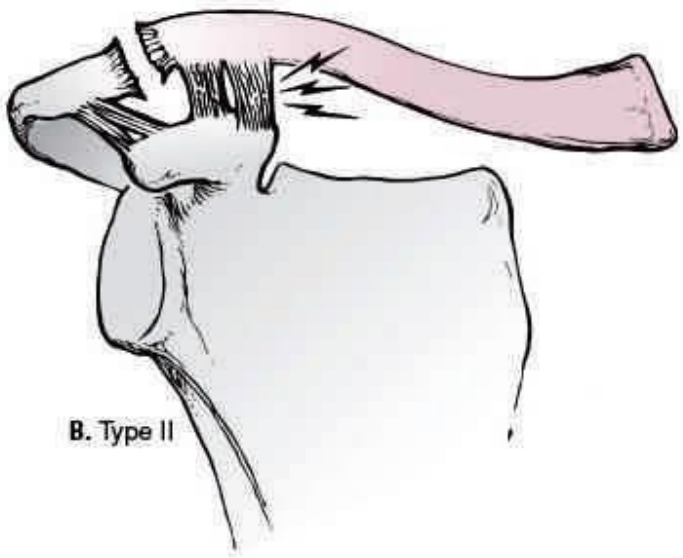
‘’Rockwood et al developed the most widely accepted classification system based on original work of Tossy et al [20]”.

The grading of AC joint injuries is dependent on the amount of injury to AC and CC ligaments. There is disruption of AC ligaments in both subacromian as well as subcoracoid dislocation, but CC ligament stays intact in subacromial dislocation whereas there is complete disruption in subcoracoid dislocation. The same way the degree of clavicular displacement decides the integrity of both deltoid and trapezius.

ROCKWOOD AND GREEN CLASSIFICATION

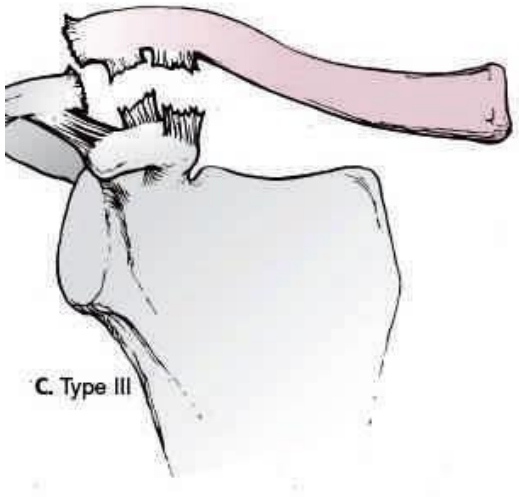


Type I A mild force to the point of the shoulder produces a minor strain to the fibers of the AC ligaments. The ligaments remain intact, and the AC joint remains stable.

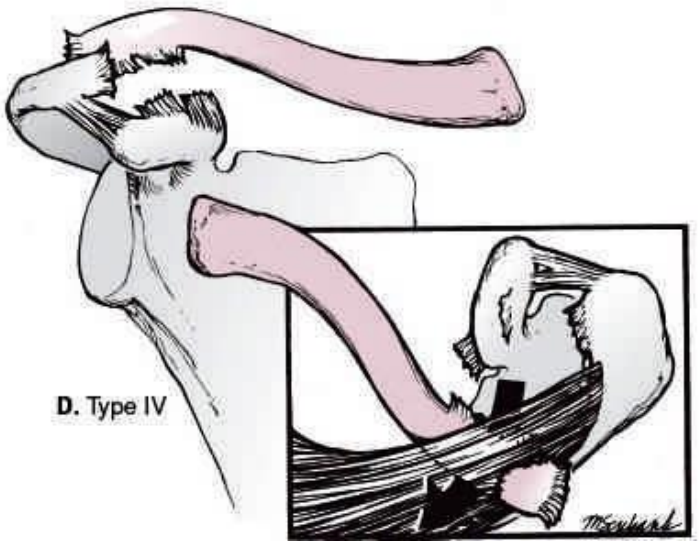


Type II A moderate force to the point of the shoulder is severe enough to rupture the ligaments of the AC joint. The distal end of the clavicle is unstable in the

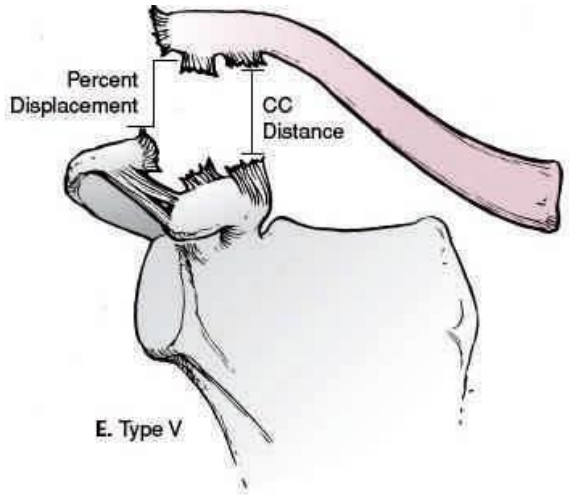
horizontal plane (i.e., anteroposterior), but vertical (i.e., superoinferior) stability is preserved by virtue of the (damaged but) intact coracoclavicular ligament. The scapula may rotate medially, producing a widening of the AC joint.



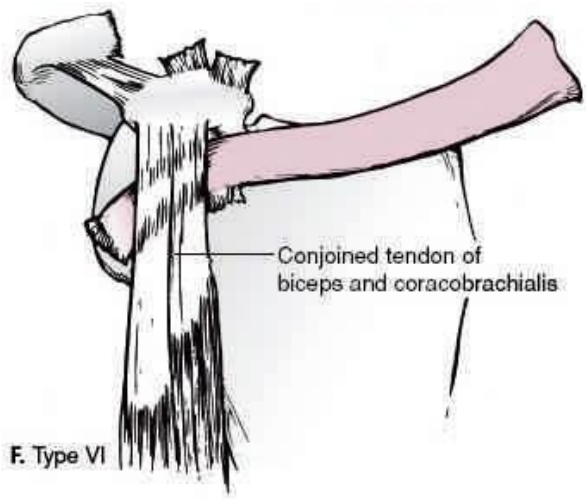
Type III A severe force is applied to the point of the shoulder which tears the AC and coracoclavicular ligaments resulting in a complete AC dislocation. The distal clavicle appears to be displaced superiorly as the scapula and shoulder complex droop inferomedially. radiographic findings include a 25–100% increase in the coracoclavicular space in comparison to the normal shoulder[21].



Type IV Posterior dislocation of the distal end of the clavicle, or a type IV AC dislocation,is relatively rare. The clavicle is posteriorly displaced into or through the trapezius muscle as the force applied to the acromion drives the scapula anteriorly and inferiorly. Posterior clavicular displacement may be so severe that the skin on the posterior aspect of the shoulder becomes tented[22].



Type V AC dislocation is a markedly more severe version of the type II injury. The distal clavicle has been stripped of all its soft tissue attachments (i.e., AC ligaments,coracoclavicular ligament, and the deltotrapezial muscle attachments) and lies subcutaneously.When combined with superior displacement of the clavicle owing to unopposed pull of the sternocleidomastoid muscle, the severe downward droop of the extremity produces a marked disfiguration of the shoulder. Radiographically, the coracoclavicular space is increased greater than 100% in comparison to the opposite, normal shoulder[23].



Type VI Inferior dislocation of the distal clavicle, is an exceedingly rare injury. The mechanism of dislocation is severe hyperabduction and external rotation of the arm,combined with retraction of the scapula. The distal clavicle occupies either a subacromial or a subcoracoid location[24].

PATTE'S CLASSIFICATION

TABLE NO.1

Grade	Denomination	Coracoclavicular distance	Facet deviation	Rockwood type
I	Simple sprain	Normal	Non	I
II	Acromioclavicular dislocation	Normal	Subluxation	II
III	Scapuloclavicular dislocation	>50% increase	Subluxation/dislocation	III
IV	Irreducible scapuloclavicular dislocation	>50% increase	Mainly posterior	IV
V			Mainly superior	V
VI	Inferior dislocation	Negative		VI

DIAGNOSIS

Ac joint injuries are usually diagnosed by clinical examination along with radiographs.

The Clinical triad of point tenderness at AC joint, pain exacerebration with cross arm adduction and relief of symptoms by injection of local anaesthetic to confirm ac joint injury.

CROSS ARM ADDUCTION TEST

Cross arm adduction test is performed with arm elevated to 90 degrees and adducted across the chest with elbow bent at 90 degrees. positive test produces pain especially at AC joint because of compression across AC joint with that motion.

PAXINOS TEST

Thumb pressure at posterior ac joint produces pain.

O BRIEN TEST

It is performed with the arm elevated to 90 degrees, elbow in extension, adduction of 10 to 15 degrees and a maximum pronation of the forearm with obligate internal rotation of the arm. The examiner applies a downward force resisted by the patient.

Symptoms referred to the top of the shoulder and confirmed by examiner palpation suggest AC joint pathology. Localization of pain more distal to the rotator interval or anterior aspect of the shoulder suggests possible labral or biceps injury.

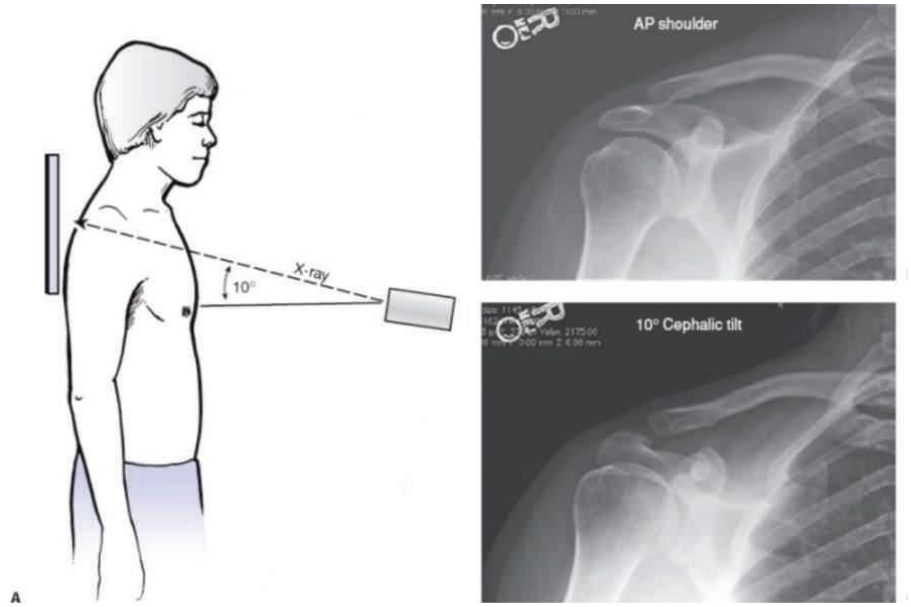
RADIOLOGY

AP View

Routine AP views should be obtained with the patient standing or sitting and their back against the x-ray cassette, the arms hanging unsupported at the side. Because of significant individual variation in AC joint anatomy and because the CC interspace will vary with the angle of the x-ray beam and with the distance between the beam and the patient, both AC joints should be imaged simultaneously on one large (14- × 17-in) cassette.

Zanca view[25]

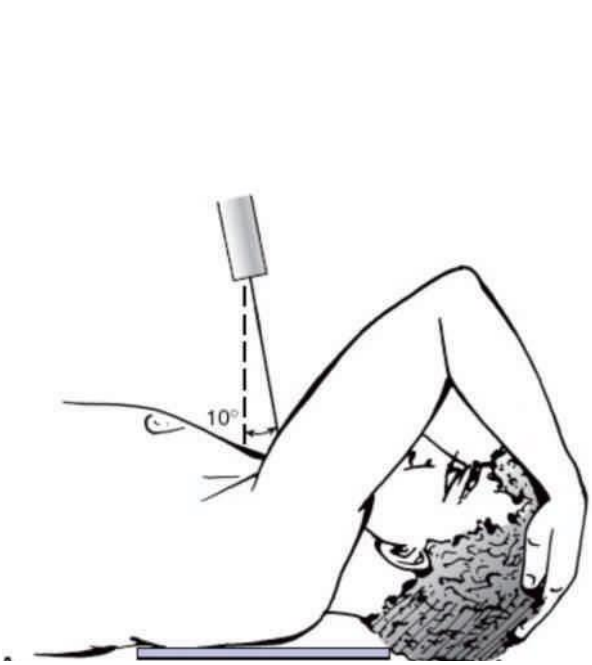
In AP view the distal clavicle and acromion are superimposed on the spine of scapula subtle injuries of ac joint are missed. So 10-15 degree cephalic tilt view to project an unobscured view of the joint .This cephalic tilt allows for better exposure and standardise the distance between clavicle and coracoid which apparently increases with AP view secondary to x ray parallax and bone contour.



Axillary lateral view

Axillary lateral view taken with cassette placed on superior aspect of shoulder and medial enough to expose lateral third of clavicle as much as possible. It will reveal any posterior displacement of the clavicle as well as any small fractures of coracoid.

Stryker notch view



Patient in supine position with arm elevated over the head with palm behind the head with humerus must be parallel to longitudinal axis of the body with the elbow point towards the ceiling .It helps to evaluate for coracoid fractures when ac joint dislocation on AP view but CC distance is normal or equal to opposite side.

MATERIALS AND METHODS

Source of data

This was a prospective study where 24 patients admitted in ortho ward in Govt Mohan Kumaramangalam Medical College Hospital with Acromioclavicular joint disruption type III to type VI from October 2017 to october 2019.

1. All cases were operated in our hospital.
2. Minimum of 12 months of post-operative follow up
3. Specified postoperative protocol was followed for all patients.
4. Outcome was measured based on Constant murley score at intervals of 6, 12, 24 weeks and 1 year
5. Radiological assessment was done at intervals of 6, 12, 24 weeks and 1 year.
6. The time protocol extends from within 24 hours of injury to 30 days.

Inclusion criteria

All the patients with

1. Closed AC joint disruption TYPE III TO VI
2. Age >25 years to < 60 years

Exclusion criteria

Patients with

1. AC joint disruption type I & II
2. Medically unfit for surgery
3. Associated fracture of clavicle
4. Fractures in the limb
5. Ligamentous laxity disorders
6. Age <25years & >60 years

TREATMENT

All the patients with acromioclavicular joint disruption Type III to Type VI were treated surgically and periodic follow up done. Informed consent was taken from all the patients that fit the inclusion criteria were included in the study.

INITIAL MANAGEMENT

Primary resuscitation if required done for the patients and clinical and radiological examination done.

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

PREOPERATIVE PLANNING

1) X rays of the shoulder – Antero-posterior and Zanca View
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 treatment given.

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 formedical and anesthetic fitness were done.

Patients were operated using Hamstring grafts and double looped 5mm suture anchors, Free Endobutton, k wire. Operative procedure was documented interms of operative time, size of screws, sutures anchors for anchoring the grafts.

IMPLANTS PROFILE

5MM DOUBLE LOADED SUTURE ANCHOR

4 HOLED FREE ENDOBUTTON

2 HOLED RECON PLATE WITH 5.0 ETHIBOND

OPERATIVE PROCEDURE

The total number of patients were divided Randomly into three groups Group A, Group B and Group C.

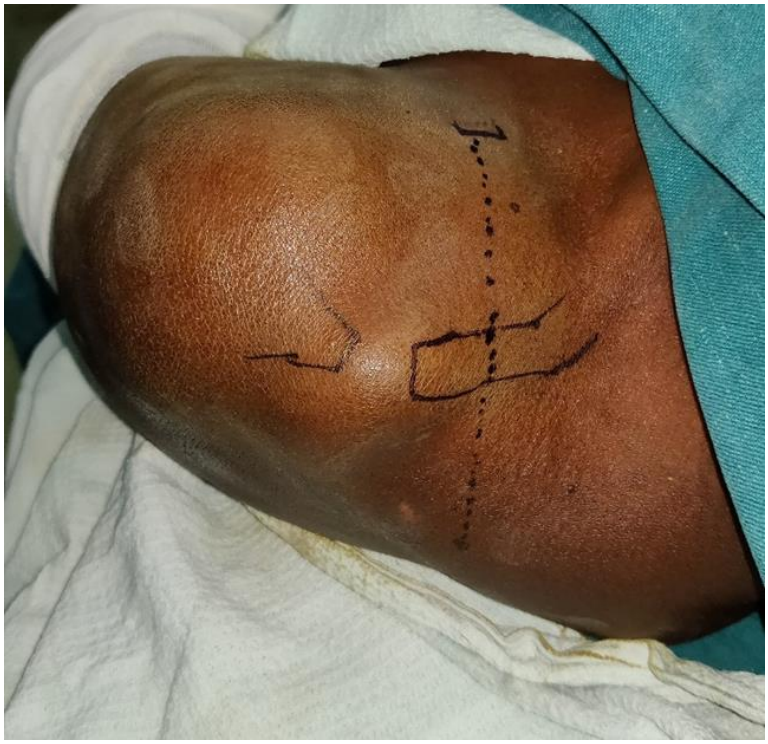
- Group A ; Treated by reconstruction of CC Ligaments by Double loaded 5mm Suture anchors tied with 2 holed Recon plate and k wire fixation from acromion to clavicle
- Group B; Treated by reconstruction of CC Ligaments by Endobutton flip technique with 5.0 Ethibond tied over 2 holed recon plate and k wire fixation from acromion to clavicle
- Group C; Treated by reconstruction of CC Ligaments by Hamstring autograft

Group A

Coraco clavicular stabilisation using suture anchor technique[26]

Beech chair position

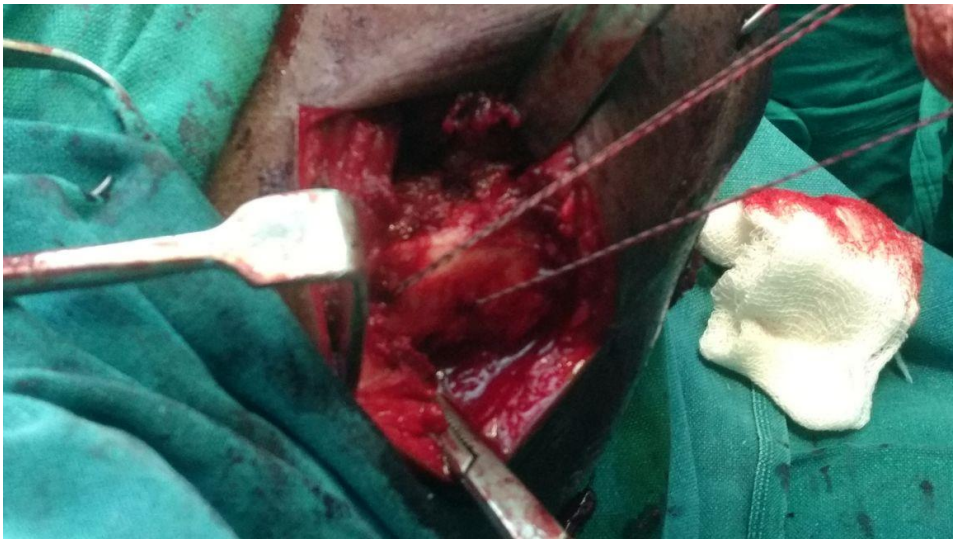
Saber cut incision



All the surgeries performed under supraclavicular block in supine position .The incision was made along the distal clavicle and acromion. After subcutaneous dissection the dislocated acromioclavicular joint, the torn coracoclavicular ligament was exposed.

The Coracoid process was palpated by the fingertip to confirm the bony part of the base. In this study Suture anchor (5.0mm in diameter supplied by BIODEK) were supplied with four bundles of sutures attached to each anchor.

Suture anchor was inserted into base of coracoid after predilling using 2.5mm drill bit.



The Sutures attached to the anchor were pulled separately through two bone holes drilled in distal clavicle 4.5cm slightly posteriorly (conoid part) and 3cm slightly anteriorly (trapezoid part) from lateral end of clavicle and secured with two holed recon plate applied over the superior border of clavicle. Capsule ligamentous sleeve was then sutured to enhance horizontal stability.

Deltotrapezial detachments were repaired.2 k wires of 2mm size were passed from acromion to lateral end of clavicle to maintain reduction.

Wounds closed in layers .K wires were routinely removed after 6 weeks.

Group B

Acromioclavicular joint reduction and CC ligament reconstruction with endobutton flip technique[27]

The patient is placed in supine position under supraclavicular block, Access through Roberts incision made topographically along anterior edge of clavicle 5mm medial to acromioclavicular joint to the top edge of coracoid process. The deltotrapezial fascia is opened and deltoid detached to visualise the acromioclavicular joint and coracoid process .At the coracoid base medial and lateral edges were made out clearly.

A drill made over the base of the coracoid directed slightly anteriorly using 4.5mm drill bit. Free 4 Holed Endobutton filled with 5.0 Ethibond were pushed into the coracoid drill hole untill it protrudes out of the underside of coracoid. Ethibond in the upper part of endobutton were pulled to lock the endobutton to the underside of the coracoid.

The two pairs of ethibond tails are pulled out in the 2 holed recon plate applied over anatomical conoid and trapezoid drill hole made over distal end of clavicle. Firm downward pressure is applied on the Clavicle to maintain reduction. Two K Wires applied from acromion to lateral end of clavicle. The Ethibond tied over the recon plate.

Group C

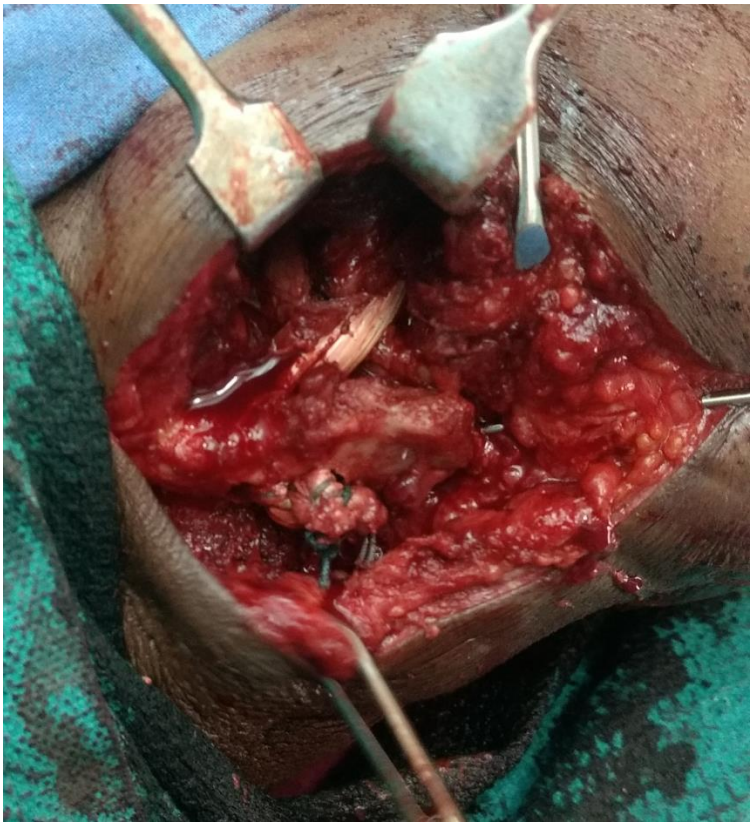
Acromioclavicular joint reduction and reconstruction using autologous Hamstring graft [28]

Curvi linear incision from distal end of clavicle in lines of langer to the tip of coracoid. Raise the full thickness flaps anteriorly and posteriorly on the clavicle. Release the delto trapezial muscles and dissect coracoid posterior to deltoid.once coracoid is exposed create a tunnel under coracoid with a right angled clamp to ensure easy graft passage.

Drill the first tunnel 45 mm from the distal clavicle (35 mm if distal clavicular resection has already been performed) using an appropriate steel reamer. It should be positioned slightly posterior to re-create normal conoid position. Drill the second tunnel 15 mm lateral to the first tunnel slightly anteriorly to re-create trapezoid position.

Pass the lateral limb of the graft with suture through the first (posterior) tunnel and cross it posteriorly so that it will ultimately be a figure-of-eight. Then feed the medial limb of the graft through the anterior tunnel.

Do not cross the suture, but pass it directly so that it will be a circle.over reduce the acromioclavicular joint manually and tie the graft which was taken out through the drill holes made in the distal clavicle. Non absorble Sutures applied to both limbs of the graft and sutured with periosteum of clavicle.



Route the remaining lateral limb of the tendon graft and suture it to the acromion as in an acromioclavicular ligament reconstruction. Close the deltotrapezial interval securely and close the skin with absorbable monofilament suture.

POST OPERATIVE PROTOCOL;

- Sutures removed at 12th postoperative day
- K wires are usually removed at 4 weeks
- Brace is worn for 6 weeks, removed only for active-assisted and pendulum exercises.
- Strengthening begins at 12 weeks,
- Return to sports is in 6 months.

CONSTANT SCORE[29]

Patient's Details

Operation/Diagnosis: **Date:**_____

Side: R L

Examination: Pre-op

3 months 6months

1 year 2 years ___ years

A.- Pain (/15): **Average (1 + 2)** ☐ **A**

1. Do you have pain in your shoulder (normal activities)?

No =15 pts, Mild pain = 10 pts, Moderate = 5 pts, Severe or permanent = 0. ___

2. Linear scale:

If "0" means no pain and "15" is the maximum pain you can experience, please circle where is the level of pain of your shoulder. (Points given are inverse to the scale. E.g. level 5 in the scale means 10 points)

Level of pain:

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

Points:

15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0

___

☐ **B**

B.- Activities of daily living (/20) **Total (1 + 2 + 3 + 4)**

1. Is your occupation or daily living limited by your shoulder?

No = 4, Moderate limitation = 2, Severe limitation = 0 ___

2. Are your leisure and recreational activities limited by your shoulder?

No = 4, Moderate limitation = 2, Severe limitation = 0 ___

3. Is your night sleep disturbed by your shoulder?

No = 2, Sometimes = 1, Yes = 0 ___

4. State to what level you can use your arm for painless, reasonably activities.

Waist = 2, Xiphoid (sternum) = 4, Neck = 6, Head = 8, Above head = 10 ___

C.- Range of movement (leave this for the doctor or physiotherapist) **(/40):** **Total (1 + 2 + 3 + 4)** ☐ **C**

1.- FWD Flexion:

0 - 30	0 pts
31 -60	2 pts
61 - 90	4 pts
91 - 120	6 pts
121- 150	8 pts
> 150	10 pts

___

2.- Abduction:

0 - 30	
31 - 60	
61 - 90	
91 - 120	
121 - 150	
> 150	

___

3.- External Rotation: ___

Hand behind head & elbow forward	2
Hand behind head & elbow back	4
Hand above head & elbow forward	6
Hand above head & elbow back	8
Full elevation of arm	10

4.- Internal Rotation: (Dorsum hand to) ___

Thigh	0
Buttock	2
SI joint	4
Waist	6
T12	8
Between shoulder blades	10

D.- Power (/25): Points: average (kg) x 2 = ☐ **D**

First pull: Second pull: Third pull: Fourth pull: Fifth pull:

Average pulls:

TOTAL (/100): A + B + C+ D ☐

OBSERVATIONS

This study comprised of 24 patients were admitted in the department of Orthopaedics Govt mohan kumaramangalam medical College Hospital. The following are the observations and the results compiled at the end of study.

TABLE NO. 2

AGE WISE DISTRIBUTION (n=24)

S.No	Age group	No of cases				Percentage%
			A	B	C	
1	20-30 yrs	4	1	1	2	16
2	30-40yrs	7	1	4	2	29
3	40-50yrs	12	5	3	4	50
4	50-60yrs	1	0	1	0	5

CHART NO. 1

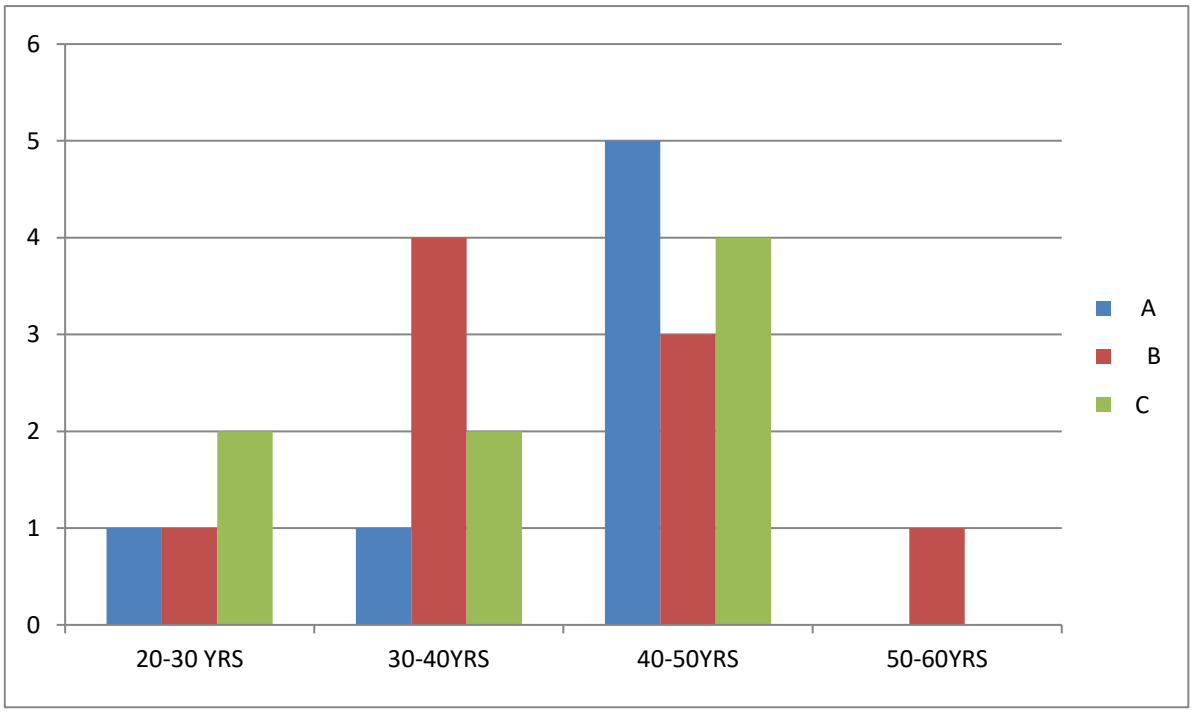


TABLE NO. 3

SEX WISE DISTRIBUTION

S.No	Sex	No of Cases				Percentage
			A	B	C	
1	MALE	23	7	8	8	96
2	FEMALE	1	1	0	0	4

CHART NO. 2

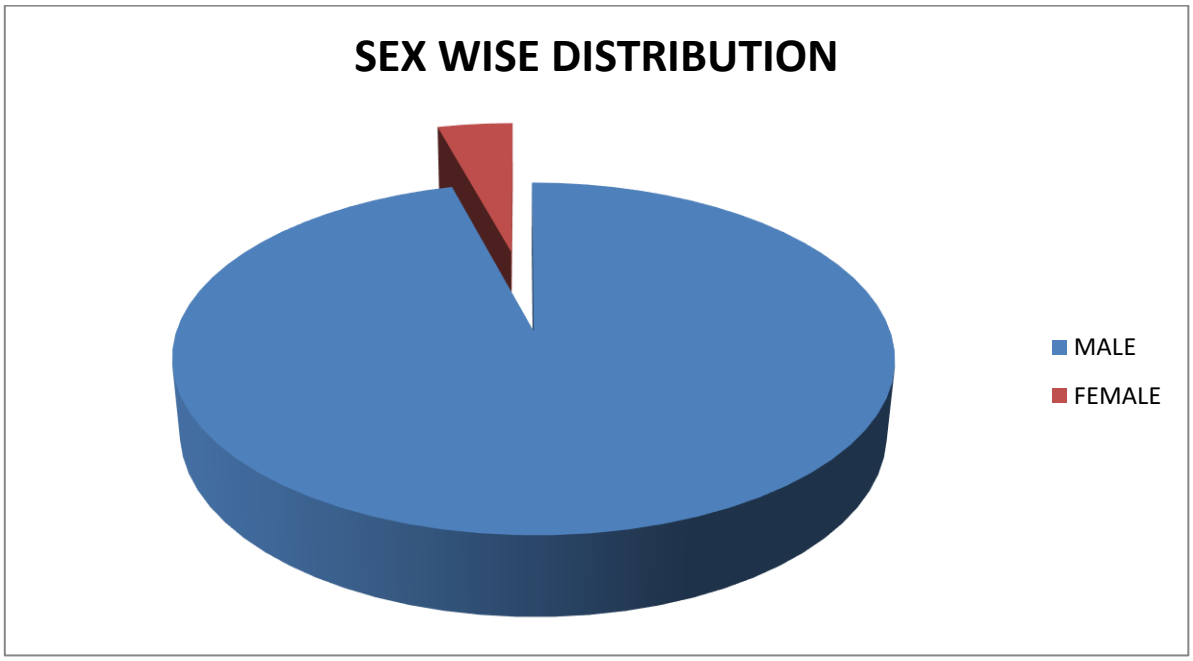


TABLE NO. 4

DISTRIBUTION ACCORDING TO MODE OF INJURY

S.No	Mode	No of cases				Percentage
			A	B	C	
1	Self fall	10	2	4	4	42
2	RTA	14	6	4	4	48

CHART NO. 3

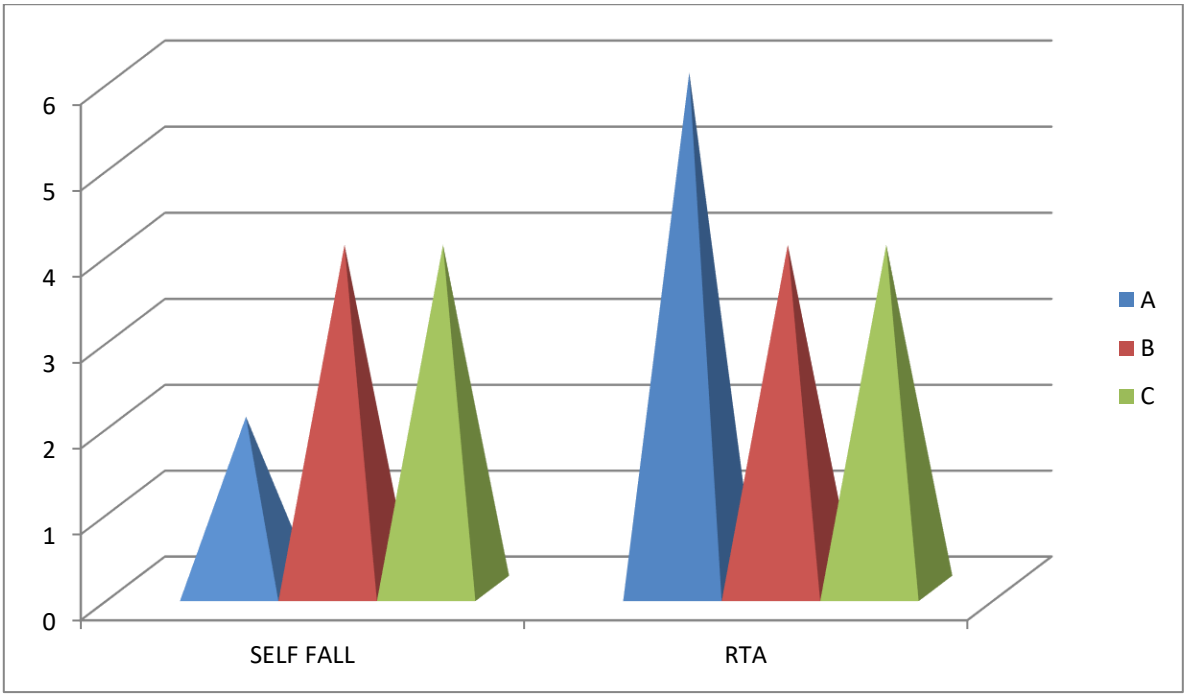


TABLE NO. 5

DISTRIBUTION ACCORDING TO SIDE

	TOTAL	A	B	C
Right	13	5	5	3
Left	11	3	3	5

CHART NO. 4

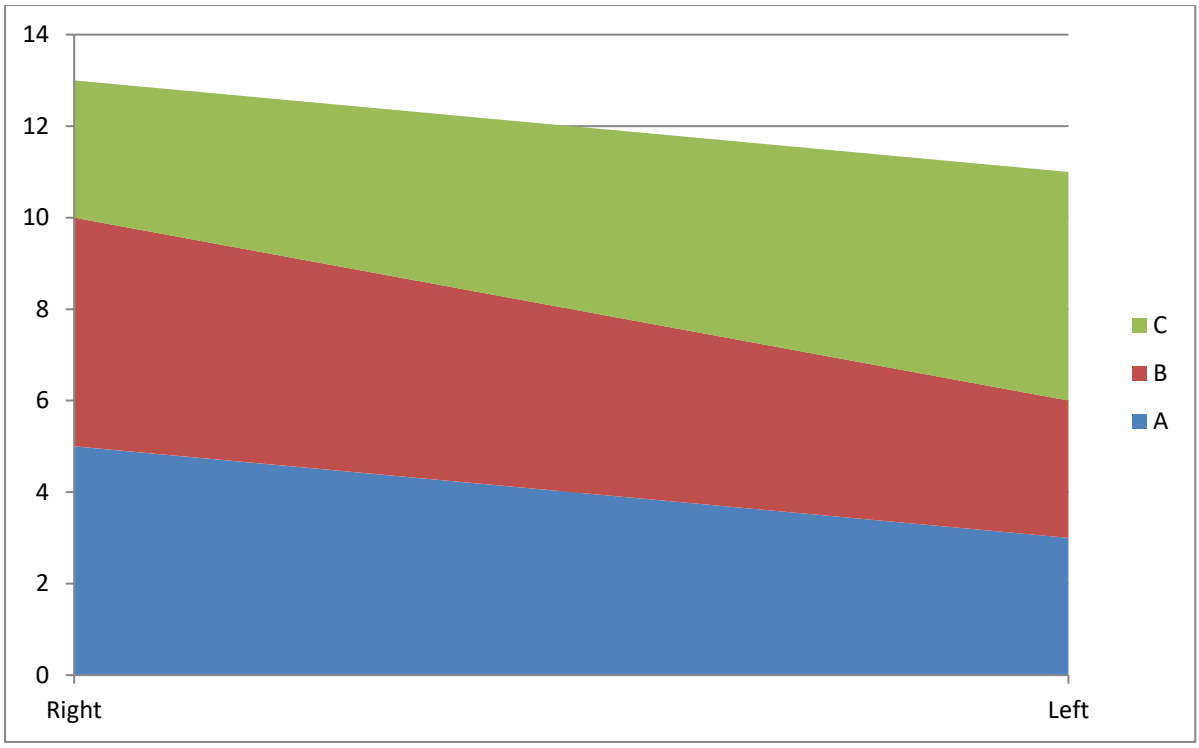
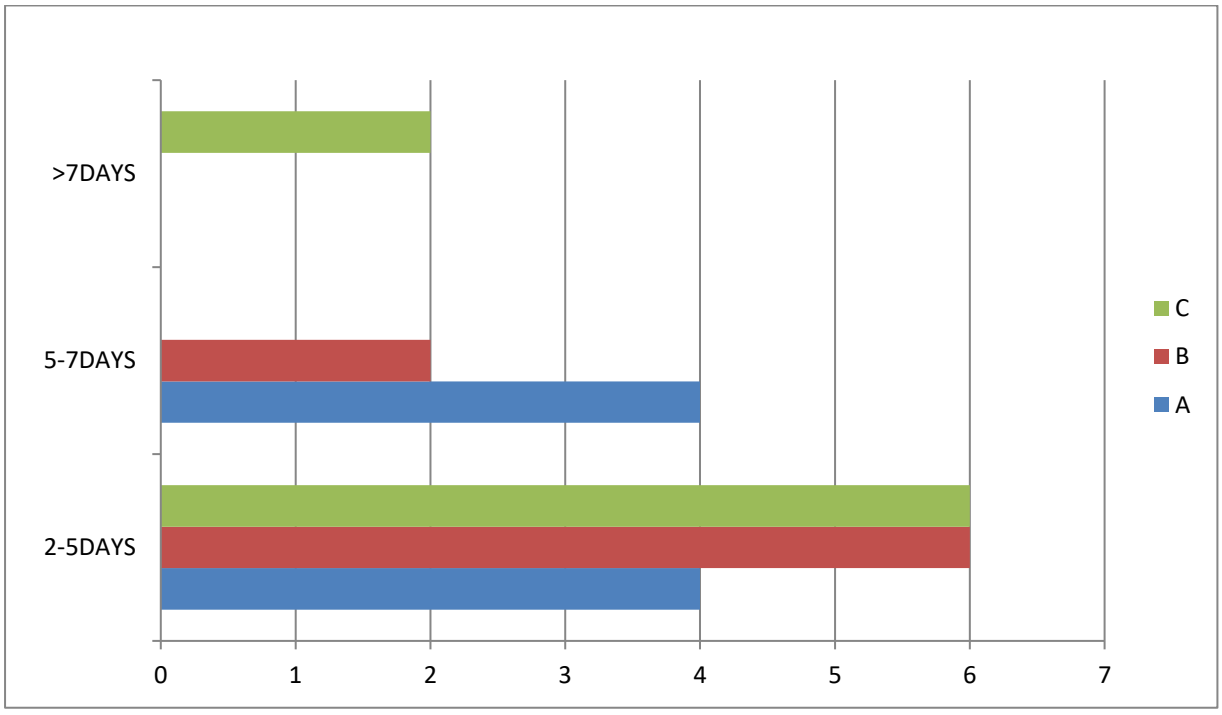


TABLE NO. 6

TIME INTERVAL BETWEEN INJURY AND SURGERY

		A	B	C
2-5DAYS	16	4	6	6
5-7DAYS	6	4	2	0
>7DAYS	2	0	0	2

CHART NO. 5



RESULTS

For all the twenty four cases treated by three surgical methods constant score has been applied. All the cases were followed at 6weeks, 3months, 6 months and 12months intervals. The mean value has been calculated for pain, range of movements and radiographic reduction.

TABLE NO. 7

	GROUP					
	A		B		C	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
3MTS_Xray	4.0	.0	4.0	.0	4.0	.0
3MTS_Pain	2.9	.4	3.0	.0	3.0	.0
3MTS_ABD	3.0	.0	3.0	.0	3.0	.0
3MTS_Score	85.0	1.9	83.3	3.2	83.8	1.3

In three months follow up the average mean score for abduction and radiological position of AC joint was found to be equal among all the three methods. But A group pts had less postoperative pain than compared to B and C.

TABLE NO. 8

	GROUP					
	A		**B**		**C**	
	Mean	**Standard Deviation**	**Mean**	**Standard Deviation**	**Mean**	**Standard Deviation**
6MTS_Xray	3.9	.4	4.0	.0	4.0	.0
6MTS_Pain	3.6	.5	3.4	.5	3.0	.0
6MTS_ABD	4.0	.0	4.0	.0	4.0	.0
6MTS_Score	88.0	.9	87.0	2.8	87.3	1.5

In 6 months follow up patients treated by suture anchor has slightly increased constant score than treated by endobutton flip method and autograft transfer technique. But all the three methods had good functional outcome in our study. There was no statistically significant difference between the three methods.

TABLE NO. 9

	GROUP					
	A		B		C	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
12MTS_Xray	3.9	.4	4.0	.0	4.0	.0
12MTS_Pain	3.8	.5	4.0	.0	3.9	.4
12MTS_ABD	4.0	.0	4.0	.0	4.0	.0
12MTS_Score	93.8	2.2	91.8	2.5	92.0	1.9

In 1year follow up all the patients reduction was found to be satisfactory radiologically and statistically insignificant. But the patients treated using suture anchor had slightly higher constant score than compared to other two methods. All the patients had good functional and radiological outcome. None of the method is superior to others in reconstructing Coracoclavicular ligament.

TABLE NO. 10 ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
3MTS_Pain	Between Groups	.083	2	.042	1.000	.385
	Within Groups	.875	21	.042		
	Total	.958	23			
6MTS_Pain	Between Groups	1.583	2	.792	4.433	.025
	Within Groups	3.750	21	.179		
	Total	5.333	23			
12MTS_Pain	Between Groups	.250	2	.125	1.105	.350
	Within Groups	2.375	21	.113		
	Total	2.625	23			
3MTS_ABD	Between Groups	.000	2	.000	.	.
	Within Groups	.000	21	.000		
	Total	.000	23			
6MTS_ABD	Between Groups	.000	2	.000	.	.
	Within Groups	.000	21	.000		
	Total	.000	23			
12MTS_ABD	Between Groups	.000	2	.000	.	.
	Within Groups	.000	21	.000		
	Total	.000	23			
3MTS_Score	Between Groups	13.000	2	6.500	1.276	.300
	Within Groups	107.000	21	5.095		
	Total	120.000	23			
6MTS_Score	Between Groups	4.333	2	2.167	.587	.565
	Within Groups	77.500	21	3.690		
	Total	81.833	23			
12MTS_Score	Between Groups	19.000	2	9.500	1.975	.164
	Within Groups	101.000	21	4.810		
	Total	120.000	23			
3MTS_Xray	Between Groups	.000	2	.000	.	.
	Within Groups	.000	21	.000		
	Total	.000	23			
6MTS_Xray	Between Groups	.083	2	.042	1.000	.385
	Within Groups	.875	21	.042		
	Total	.958	23			
12MTS_Xray	Between Groups	.083	2	.042	1.000	.385
	Within Groups	.875	21	.042		
	Total	.958	23			

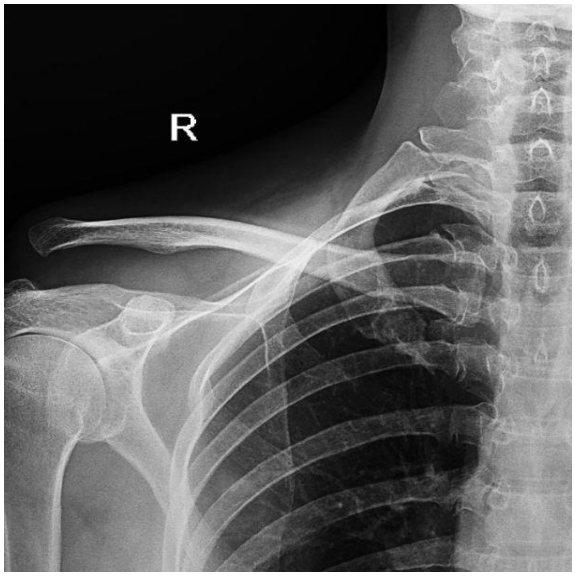
In our study all the three methods had yielded good functional outcome in the management of acromioclavicular joint disruptions type III to type VI. All the three methods are comparable and none of the method is statistically significant than the others.

CASE ILLUSTRATIONS

CASE 1

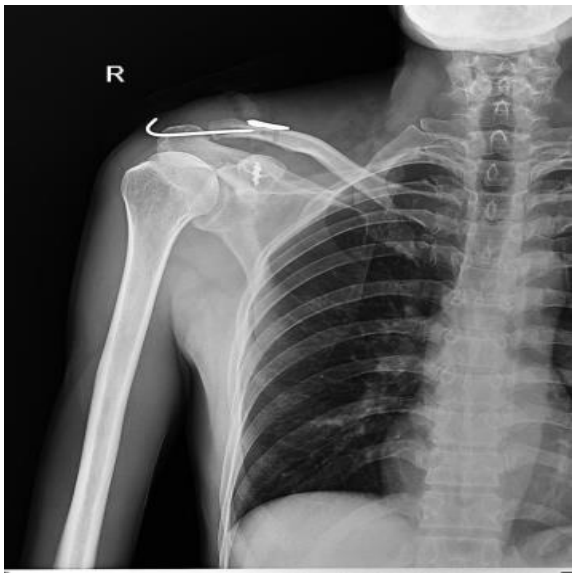
NAME	Mr. Govindaraj
AGE/ SEX	48 y / Male
IP NO	44251
MODE OF INJURY	Self fall
SIDE	Right
TYPE	III
SURGICAL MANAGEMENT	Open reduction and AC joint reconstruction with double loaded suture anchor
COMPLICATION	NIL

Pre op



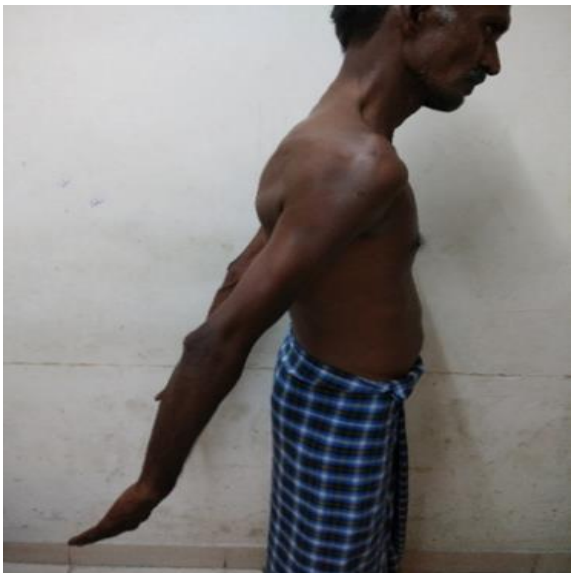
Clinical follow up

6 weeks



3months

6months **1 year**

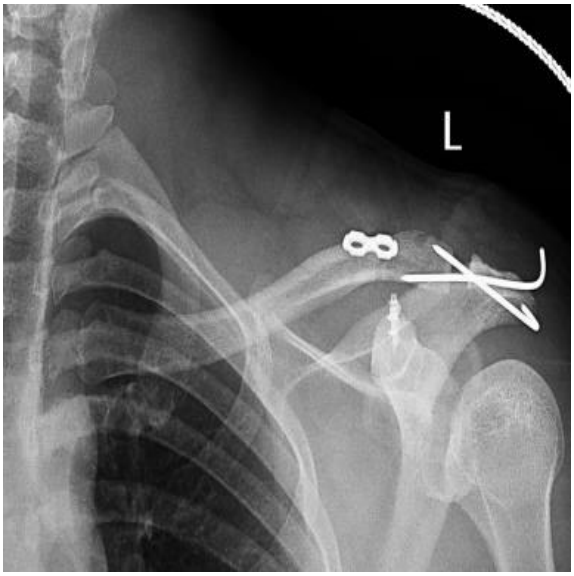


CASE 2

NAME	Mr. Kalaiarasan
AGE/ SEX	51 y / Male
IP NO	39817
MODE OF INJURY	RTA
SIDE	Left
TYPE	III
SURGICAL MANAGEMENT	Open reduction and AC joint reconstruction with double loaded suture anchor
COMPLICATION	NIL

6 weeks

3months



6months **1 year**

Clinical follow up

CASE 3

NAME	Mr. Manikandan
AGE/ SEX	26 y / Male
IP NO	45267
MODE OF INJURY	Self-Fall
SIDE	Right
TYPE	III
SURGICAL MANAGEMENT	Open Reduction and AC joint reconstruction with endobutton flip technique
COMPLICATION	K wire pull out

PRE OP

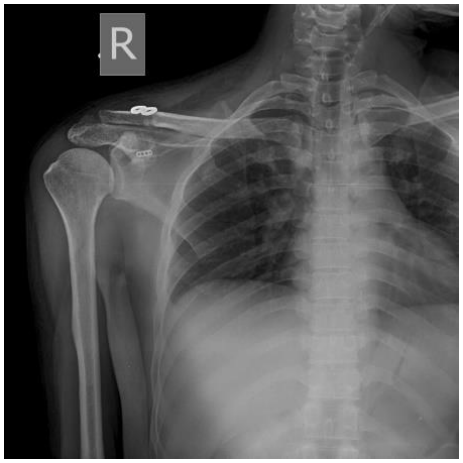
FOLLOW UP

K wire pull out

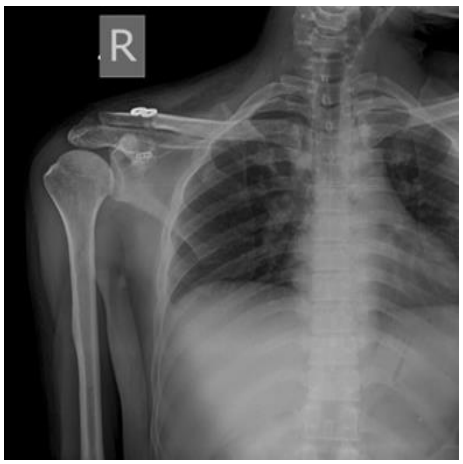
immediate post op

6 weeks

3months



6months



1 year

Clinical follow up

CASE 4

NAME	Mr. Nachiyappan
AGE/ SEX	35 y / Male
IP NO	854231
MODE OF INJURY	Self-fall
SIDE	Left
TYPE	IV
SURGICAL MANAGEMENT	Open Reduction and AC joint reconstruction with endobutton flip technique
COMPLICATION	NIL

Zanca view

FOLLOW UP

6 weeks

3months

6months

1 year

CLINICAL FOLLOW UP

CASE 5

NAME	Mr. Settu
AGE/ SEX	35 y /Male
IP NO	35627
MODE OF INJURY	RTA
SIDE	Left
TYPE	III
SURGICAL MANAGEMENT	Open reduction and AC joint reconstruction with autologous hamstring graft technique
COMPLICATION	NIL

Zanca view

4 weeks

12 weeks

6months

1 year

Clinical follow up

CASE 6

NAME	Mr. Mohan
AGE/ SEX	24 y /Male
IP NO	48169
MODE OF INJURY	RTA
SIDE	Right
TYPE	V
SURGICAL MANAGEMENT	Open reduction and AC joint reconstruction with autologous hamstring graft technique
COMPLICATION	Calcification

Pre op

4 weeks

12 weeks

6months

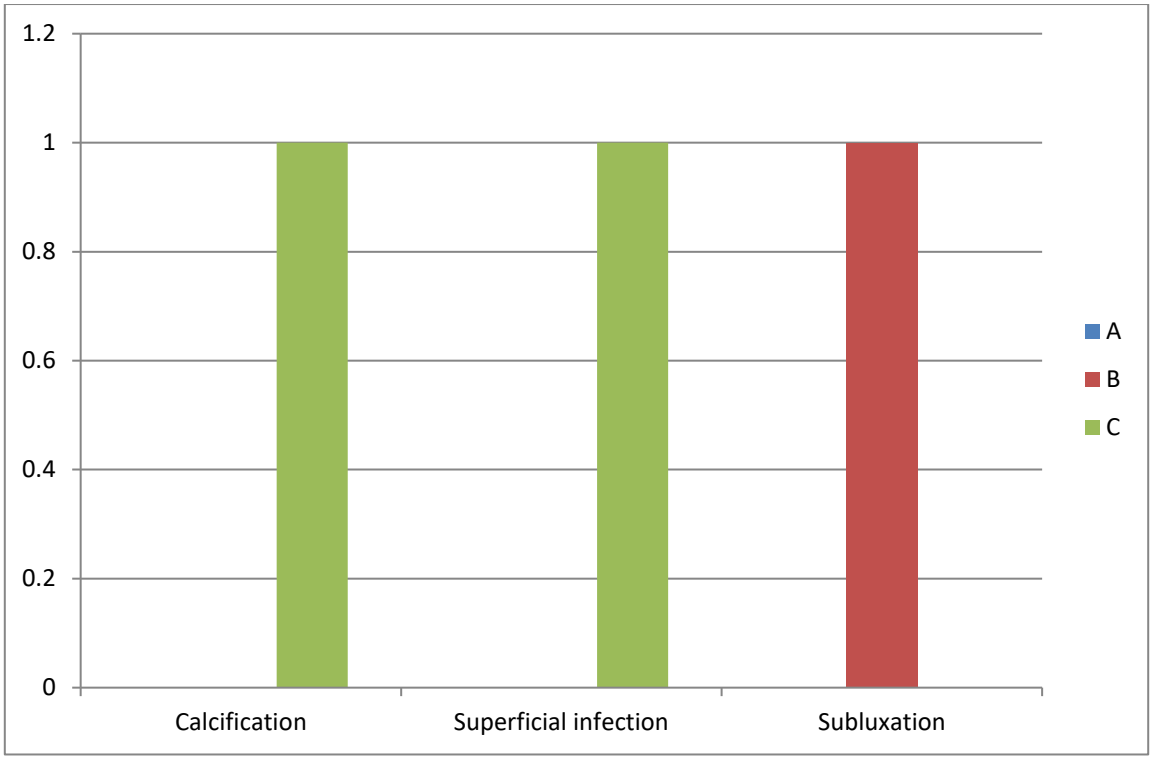
1 year

COMPLICATIONS

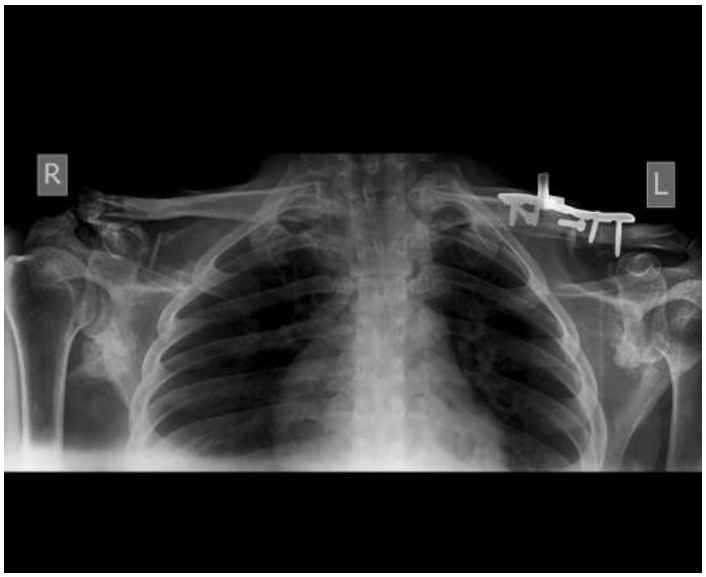
TABLE NO.11

COMPLICATIONS:	GROUP A	GROUP B	GROUP C
Calcification	0	0	1
Superficial infection	0	0	1
Subluxation	0	1	0

CHART NO. 6



In ac joint disruptions treated with hamstring graft technique one patient had infection managed with antibiotics and one pt had calcification over graft applied site. But patient had good range of movements post operative six month follow up.



In ac joint disruptions treated with endobutton flip technique one pt had subluxation due to non compliance. The patient had attained abduction 100^0.

DISCUSSION

Surgical aim of Acromioclavicular joint dislocations will be

- Stable reduction of acromioclavicular joint
- Coracoclavicular and Acromioclavicular ligaments must be repaired or reconstructed anatomically
- Deltotrapezial integrity attained

Several studies have been published regarding various surgical methods of reduction of acromioclavicular joint individually. But No comparative studies are published using hamstring graft vs fibre wire loaded suture anchor vs endobutton flip technique. In our study all the patients diagnosed as acromioclavicular joint disruption Type III to Type VI were randomly divided into three groups A,B,C. Group A treated with 5mm Double loaded suture anchors ,Group B treated with Endobutton Flip technique, Group C treated with Hamstring graft technique. Eight patients included in each group. Most of the patients were male and mode of injury is RTA .In our study 22 patients were operated within 5 -7 days duration, 2 patients were of more than 7days , 2 patients underwent native treatment initially.

All the patients were operated and standard post operative care followed. Intially shoulder arm immobiliser in adducted internal rotated position applied for all the patients. Gentle passive motion of shoulder started in the immediate post operative day. K wires are removed at 4 weeks. Active shoulder exercises and strengthening are advised at 4 weeks. Contact sports advised after 6 months.

Group A

TABLE NO.12

Study	Duration	Total pts	Pt nos with good rom	Mean constant score	Complications
Basyoni Y et al	2year	15	14	92.8	subluxation
Zhang et al	2year	28	26	96.3	Fixation loosening
Darren et al	2year	22	18	92.3	Anchor pull out
Our study	1 year	08	08	93.8	

In our study 8 patients treated with CC ligament reconstruction with suture anchor over base of coracoid. In this method less chances of Neurovascular injury and decreased surgical time. Direction of CC ligaments 2 strands have greater tensile strength of native Coracoclavicular ligament. As no instrumentation / fixation materials are passed under coracoid less risk of neurovascular injury. Sutures are tied over plate strengthening repair by augmentation of cortex clavicle and prevention of osteolysis of distal clavicle. All the 8 cases had good range of movement. The mean constant shoulder score in this method is 93.8.

Group B

TABLE NO. 13

Study	Total Nos	Good ROM Nos	Endobutton Nos used	Constant score mean	complications
Lei zhang et al	21	18	Double endobutton	91	Infection,stitch granuloma
Raif ozden et al	10	10	Double endobutton	89	
Suresh kumar et al	20	17	Double endobutton	90	Infection,wound gaping
Our study	8	7	Single endobutton and 2 holed recon plate	91.8	Subluxation

In our study 8 patients were treated by reduction of AC joint and reconstruction of CC ligament by endobutton flip technique. In this method better anatomical replication of coracoclavicular ligament and better reduction of AC joint has been achieved. The cost of the endobutton is cheaper than suture anchor. If the endobutton is not flipped horizontally under coracoid it results in subluxation. Chances Of neurovascular injury is higher .In our study all the 8 cases had good range of movements at 6 and 12 months follow up. None of the patients had neurovascular injury.one patient had subluxation at 3 months due to non compliance. The mean constant score was 92.8.

Group C

TABLE NO.14

Study	Total pts Nos	Good ROM nos	Mean constant score	Complications
Khaleed et al	20	16	93.7	Infections
J Virtanen et al	39	25	83	# clavicle-5pts, # coracoid 4pts
Our study	8	8	92	Calcification and infection

In our study 8 patients were treated by reduction of AC joint and reconstruction of CC and AC ligament by Hamstring graft technique. In this technique Coracoclavicular distance reduced under stress loading and greater stability better anatomical replication of Coracoclavicular and acromioclavicular ligament. Graft donor site morbidity and patient has to be operated either under GA/RA & SA. The duration of surgery is more compared to other methods. In our study one patient had infection. Infection managed with IV antibiotics and skin grafting for gaping. All 8 patients had good range of motion and constant scores were good at 6 and 12 months interval.one patient had developed calcification along the graft applied site. But the patient had good constant score.

Follow Up at 6 weeks, 3 months,6 months and . The mean constant score using hamstring graft is 92.

At each follow up:

Score	Subjective (pain)	Objective (abduction)	X-Rays (Displacement)
4	No pain	No limitation	No displacement
3	Pain on excessive activity	Limitation <1/3rd of abduction	Subluxation
2	Pain on routine activity	Limitation 1/3-2/3 of abduction	Dislocation
1	Pain at rest	Limitation of > 2/3rd of abduction	Arthritis

CONCLUSION

In our study ac joint disruption type III to type VI has been treated with endobutton flip method ,suture anchor and using hamstring graft technique. The mean constant score was 91.8,93.8 and 92 respectively. There was no statistical significant difference between the three groups.

In hamstring graft technique one patient had infection and one patient had calcification over graft applied site and morbidity was high. Chances of injury to neurovascular structures is high during dissection over coracoid and during passing graft. All the patients had good range of movements without pain and resumed their normal activities in six months interval.

In endobutton flip method one patient had subluxation at three months due to early weight lifting activites .All other patients had good range of movements within six months interval and resumed normal activities without discomfort. The chances for subluxation due to malposition of endobutton under coracoid is high .

In suture anchor method all patients had good range of movements.None of the complications described above has been observed in this group. The chances for neurovascular injury is very less compared to other methods. All the patients resumed normal activites within three months intervals.

The mean constant score in our study is more than 90 in all the three methods. Statistically there was no significant difference between groups. Patients had good range of movements without pain and CC distance maintained in the follow up x rays. In order to tell one method better than other further follow up is required .In one year follow up patients treated with suture anchor had less complications compared to other methods.

PATIENT CONSENT FORM

STUDY TITLE:

"FUNCTIONAL OUTCOME OF SURGICAL CORRECTION OF ACROMIO CLAVICULAR JOINT DISRUPTION OF TYPE III TO VI"

Department of Orthopaedics, GMKMCH

PARTICIPANT NAME : AGE : SEX: I.P. NO :

I confirm that I have understood the purpose of surgical/invasive procedure for the above study. I have the opportunity to ask the question and all my questions and doubts have been answered to my satisfaction.

I have been explained about the possible complications that may occur during and after medical/ surgical procedure. I understand that my participation in the study is voluntary and that I am free to withdraw at any time without giving any reason.

I understand that investigator, regulatory authorities and the ethics committee will not need my permission to look at my health records both in respect to the current study and any further research that may be conducted in relation to it, even if I withdraw from the study. I understand that my identity will not be revealed in any information released to third parties or published, unless as required under the law. I agree not to restrict the use of any data or results that arise from the study.

I hereby consent to participate in this study for various surgical/invasive procedures and their outcomes.

Time :

Date : Signature / Thumb Impression Of Patient

Place : Patient's name:

Signature of the Investigator : _____

Name of the Investigator _____

PROFORMA

Name:

Address:

Age/sex:

RELIGION:

O.PNo:

I.P No:

D.O.A:

DATE OF SURGERY:

D.O.D:

OCCUPATION;

B. CHIEF COMPLAINTS:

Duration of symptoms:

Mode of injury; FALL/RTA

Present history;

C.PAST HISTORY:

1. DM : Yes/ No
2. TB: Yes/ No
3. EPILEPSY
4. PREVIOUS SURGERY

D.PERSONAL HISTORY:

SMOKER

ALCOHOLIC

E.INITIAL ASSESSMENT OF PATIENT

1.Vitals:

PR :

BP :

RR :

Temperature :

2.GENERAL SIGNS:

Pallor

Tongue

Skin

Icterus

Cyanosis

Lymphadenopathy:

SYSTEMIC EXAMINATION:

CVS

RS

CNS

Abdomen

G/E OF UPPER LIMB;

ATTITUDE

DEFORMITY

LIMB LENGTH DISCREPANCY

MUSCLE WASTING

LOCAL EXAMINATION :

INSPECTION

PALPATION

MOVEMENTS

MOVEMENTS	PRE OP	POST OP
FLEXION		
EXTENSION		
ADDUCTION		
ABDUCTION		
INTERNAL ROTATION		
EXTERNAL ROTATION		
CIRCUMDUCTION		

MEASUREMENTS

CLINICAL DIAGNOSIS

INVESTIGATIONS

A. HB%
B. GROUPING & TYPING
C. BT/CT
D. PC
E. HIV
F. ECG
G. URINE:
   Albumin
   Sugar

H. BLOOD:

RBS

BLOOD UREA

SER.CREATININE

X RAYS

ANAESTHESIA:

SURGICAL PROCEDURE:

APPROACH

IMPLANT USED

COMPLICATIONS:

OUTCOME OF TREATMENT:

CONSTANT MURLEY SCORE

1. IMPROVEMENT
2. WORSENING OF DISEASE

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KEY TO MASTER CHART

RTA - ROAD TRAFFIC ACCIDENT

SCORE	PAIN(SUBJECTIVE)	ABDUCTION(OBJECTIVE)	X RAYS
4	NO PAIN	NO LIMITATION	NO DISPLACEMENT
3	PAIN ON EXCESSIVE ACTIVITY	LIMITATION ,1/3RD ABDUCTION	SUBLUXATION
2	PAIN ON ROUTINE ACTIVITY	LIMITATION 1/3RD-2/3RD ABDUCTION	DISLOCATION
1	PAIN AT REST	LIMITATION OF .2/3RD ABDUCTION	ARTHRITIS

MASTER CHART

S. NO	NAME	AGE /SEX	TYPE	SIDE	MODE	DOS	GROUP	X RAY			SUBJECTIVE PAIN			ABDUCTION			COMPLI CATIONS	CONSTANT SCORE		
								3 MTS	6 MTS	12 MTS	3 MTS	6 MTS	12 MTS	3 MTS	6 MTS	12 MTS		3 MTS	6 MTS	12 MTS
1	GOVINDARAJ	48/M	III	RIGHT	SELF FALL	7D	A SUTURE ANCHOR	4	4	4	3	4	4	3	4	4		84	88	94
2	KALAIARASAN	51/M	III	LEFT	RTA	5D	A SUTURE ANCHOR	4	3	3	2	3	3	3	4	4		86	88	93
3	KANAGARAJ	50/M	IV	RIGHT	SELF FALL	7D	A SUTURE ANCHOR	4	4	4	3	4	4	3	4	4		82	86	94
4	MANIKANDAN	26/M	III	RIGHT	SELF FALL	5D	B ENDOBUTTON	4	4	4	3	4	4	3	4	4	SUBLUXA TION	76	82	86
5	NATCHIYAPPAN	35/M	IV	LEFT	SELF FALL	6D	B ENDOBUTTON	4	4	4	3	3	4	3	4	4		84	90	92
6	SURESH KUMAR	38/M	V	LEFT	RTA	7D	B ENDOBUTTON	4	4	4	3	3	4	3	4	4		86	88	92
7	RAJAMMAL	35/F	III	RIGHT	SELF FALL	5D	B ENDOBUTTON	4	4	4	3	4	4	3	4	4		84	84	94
8	GOKUL	24/M	III	LEFT	RTA	3D	C HAMSTRING	4	4	4	3	3	4	3	4	4		82	86	94
9	NERU	46/M	IV	RIGHT	SELF FALL	6 MTS	C HAMSTRING	4	4	4	3	3	4	3	4	4		84	88	92
10	SANKAR	42/M	III	LEFT	RTA	3D	A SUTURE ANCHOR	4	4	4	3	4	4	3	4	4		86	88	94
11	PRABHU	24/M	III	RIGHT	RTA	7D	A SUTURE ANCHOR	4	4	4	3	3	3	3	4	4		88	88	89
12	ARUMUGAM	43/M	III	LEFT	RTA	3D	B ENDOBUTTON	4	4	4	3	3	4	3	4	4		82	90	92

S. NO	NAME	AGE /SEX	TYPE	SIDE	MODE	DOS	GROUP	X RAY			SUBJECTIVE PAIN			ABDUCTION			COMPLICATIONS	CONSTANT SCORE		
								3 MTS	6 MTS	12 MTS	3 MTS	6 MTS	12 MTS	3 MTS	6 MTS	12 MTS		3 MTS	6 MTS	12 MTS
13	LAKSHMANAN	44/M	III	RIGHT	SELF FALL	2MTS	C HAMSTRING	4	4	4	3	3	4	3	4	4	INFECTION	84	90	94
14	MOHAN	24/M	V	RIGHT	RTA	5D	C HAMSTRING	4	4	4	3	3	4	3	4	4	CALCIFICATION	84	88	94
15	SETTU	35/M	III	LEFT	RTA	5D	C HAMSTRING	4	4	4	3	3	4	3	4	4		86	88	92
16	MURALI	36/M	III	RIGHT	RTA	7D	A SUTURE ANCHOR	4	4	4	3	3	4	3	4	4		86	88	94
17	KUMAR	42/M	IV	RIGHT	RTA	5D	A SUTURE ANCHOR	4	4	4	3	4	4	3	4	4		84	89	96
18	MANIKANDAN	34/M	III	RIGHT	RTA	4D	B ENDOBUTTON	4	4	4	3	3	4	3	4	4		84	86	92
19	NERU	50/M	IV	LEFT	SELF FALL	3D	C HAMSTRING	4	4	4	3	3	3	3	4	4		82	86	90
20	PERUMAL	41/M	III	RIGHT	RTA	3D	B ENDOBUTTON	4	4	4	3	4	4	3	4	4		84	88	94
21	CHINNAPPAN	38/M	IV	LEFT	RTA	4D	C HAMSTRING	4	4	4	3	3	4	3	4	4		84	86	90
22	SUBRAMANI	40/M	III	RIGHT	SELFF ALL	5D	B ENDOBUTTON	4	4	4	3	3	4	3	4	4		86	88	92
23	GOVINDAN	42/M	III	LEFT	SELFF ALL	3D	C HAMSTRING	4	4	4	3	3	4	3	4	4		84	86	90
24	RAMASAMY	41/M	III	LEFT	RTA	3D	A SUTURE ANCHOR	4	4	4	3	4	4	3	4	4		84	89	96