CLINICAL OUTCOMES OF TYPE V ACUTE ACROMIOCLAVICAR JOINT DISLOCATION FIXATION A PROSPECTIVE STUDY

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"CLINICAL OUTCOMES OF TYPE IV AND TYPE V ACUTE ACROMIOCLAVICULAR JOINT DISLOCATION TREATED WITH DOUBLE BUTTON FIXATION - A PROSPECTIVE STUDY"

MASTER OF SURGERY

in

ORTHOPAEDICS

LIST OF ABBREVIATIONS

mm - Millimeters

cms – Centimeters

AC – Acromioclavicular

CC – coracoclavicular

SC - Sternoclavicular

mn - Months

yrs - years

RC – Rockwood classification

SC – sternoclavicular

AP – anterio-posterior

DASH – disabilities of the Arm, Shoulder, and Hand Questionnaire

IV – Intravenous

BP – Blood pressure

UL – Upper limb

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ABSTRACT

Introduction: Acromioclavicular joint injuries are amongst the most common shoulder problems accounting for about 9% of all shoulder injuries. Many treatment options ranging from non-operative to operative exist such as hook plate fixation, Bosworth screw fixation etc. In recent years double-button fixation has created an interest with respect to the implant fixation, clinical outcome, swift postop outcome, and the need for less restrictive rehabilitation protocols. It is hypothesized that Double-button will reproduce near normal anatomical stabilization with predictable coracoclavicular ligament healing. Given the fact of novelty of the technique and limited literature addressing the functional outcome of acute acromioclavicular joint dislocation treated with double button fixation and fiber tape, we intend to take up this study and evaluate the functional outcomes.

Aims and objective: To assess functional outcomes of type IV and type V acute acromioclavicular joint dislocations treated with double button fixation and fiber tape and to study different complications associated with double button fixation and fiber tape.

Material and Method: In this prospective study 36 patients who meet the inclusion criteria were admitted to Department of Orthopaedics in BLDEU'S Shri B.M. Patil's Medical College, Hospital and Research Centre, Vijayapura and informed written consent was obtained. Period of study was between 1st January 2021 to May 31st 2022 with follow up period for 6 months. All patients underwent AC joint repair using double endobutton and biofiber tape and were evaluated pre and post operatively at 6 weeks, 3 months, and 6 months. Clinical evaluation is done using DASH and CONSTANT scores. Radiological evaluation is done with Xray Bilateral shoulder AP view, axial view, and Zanca views.

Results: Results of our study were presented as Mean (Median) ±SD, counts and percentages, and diagrams. In our study we had 11 cases of Rockwood classification type 4 and 25 cases of

Rockwood classification type 5. We had 33 male patients and 3 female patients. Post operative complications were observed in 4 patients, 1 case of stitch granuloma and 3 cases of Shoulder stiffness. At the final follow-up, 32 patients had an excellent outcome as assessed by Constant score and DASH score and 4 patients had good outcome. The mean CONSTANT and DASH scores at the last follow-up were 95 (range 89 -100) and 5.3 (range 2-10) respectively. No vascular or neurological complications were noted. None of the patients had any implant related irritation or reactions.

Conclusion: From our study we conclude that AC joint repair by Endobutton and biofiber tape results in early functional recovery and full range of shoulder movements and gives both vertical & horizontal stability of Acromioclavicular joint.

Keywords: Acromioclavicular joint disruption, Endobutton, Fibertape, DASH & CONSTANT scores.

INTRODUCTION

Injuries to the acromioclavicular joint are among the most prevalent shoulder issues, accounting for around 9% of all shoulder injuries.[1–3] The acromioclavicular joint is a complicated joint, and injuries to it can vary from soft tissue disturbances that cause only little localized discomfort to serious instability, persistent pain, and biomechanical issues that cause long-term impairment of function. Milder grades of Acromioclavicular joint disruptions can be managed conservatively; there is a common consensus that high-grade injuries require surgical intervention.[4] Most of these patients are active, young, and in high demand who require accurate treatment to expect a good functional outcome. Many surgical methods are described in the literature with variable results.

Acute acromioclavicular joint dislocation can be treated with a variety of static and dynamic methods, such as suture anchors, acromioclavicular joint pinning, coracoclavicular loop cerclage, hook plates, coracoclavicular screws, coracoid transfer, coracoclavicular ligament repair, distal clavicle excision, and ligament or muscle transfer.[45] With the advent of more recent techniques, the load for the failure of the technique and implant has increased drastically.

In recent years double-button fixation has created an interest with respect to the implant fixation, clinical outcome, swift postop outcome, and the need for less restrictive rehabilitation protocols. It is hypothesized that Double-button will reproduce near normal anatomical stabilization with predictable coracoclavicular ligament healing.[4,6] Still, there is confusion regarding the ideal method of fixation with respect to technique and implant. Given the novelty of the procedure and the paucity of literature addressing the functional result of acute acromioclavicular joint dislocation treated with double button fixation and biofiber tape, we want to undertake this study and assess the functional outcomes.

OBJECTIVE OF THE STUDY

- To assess functional outcomes of type IV and type V acute acromioclavicular joint dislocations treated with double button fixation and fiber tape.

- To study different complications associated with double button fixation and fiber tape.

HISTORY

The management of acromioclavicular joint dislocations has generated debate throughout history.

The history of treating AC joint dislocations dates back to 129-199 AD by using tight bandages to push clavicle down where they reported these injuries caused by wrestling.[7,8]

The surgical management of complete AC joint separation resulting from ligament disruption has progressed and has a clear historical evolution as a result of our overall knowledge of the regional anatomy and the biomechanics of the join.

In 1861, the first description of operative management of type 4 and 5 dislocations of acromioclavicular joint injuries was done by Samuel Cooper.

Cadenat in 1917 showed transfer of the coracoacromial ligament as an option for treating these injuries which was detailed by Weaver and Dunn.[9–11]

The number of descriptions detailing operative management of treating AC joint dislocations with repairs techniques has increased during the past 10 to 15 years.

The development of implants has also prompted the use of better surgical methods and tactics. This has altered how surgical management of AC injuries is done. The reduction of the AC joint to an anatomic position is a typical objective of open reconstruction procedures.

RELEVANT ANATOMY AROUND ACROMIO-CLAVICULAR JOINT

Acromion process of the scapula and lateral end of the clavicle combine to create diarthrodial joint known as the acromioclavicular joint. A fibrocartilaginous disc of varied shape and size is located within the AC joint.

1. ACROMIO-CLAVICULAR LIGAMENTS:

The AC joint is formed and reinforced by four ligaments namely superior, inferior, anterior and posterior to cover it on all sides. The superior acromioclavicular ligament, with which deltoid and trapezius muscles attach to the acromion process and superior portion of the clavicle, contains the strongest fibers in the capsular ligaments. Muscle attachments make the AC joint more stable. These Ligaments offer stability in the horizontal plane.

2. CORACOCLAVICULAR LIGAMENT:

The CC ligament has strong fibers that connect coracoid process base to the undersurface of the clavicle. It is a very strong, powerful ligament. The CC ligament is made up of the conoid and trapezoid ligaments. Trapezoid ligament length and width are measured in centimeters. The conoid ligament is approximately 0.7 to 2.5 cm long and 0.4 to 0.95 cm wide. Lateral fibers of trapezoid ligament are 10mm away from the lateral end of the clavicle.

The conoid ligament has a cone-like structure, with the base of the coracoid process as its attachment point at the apex, and the conoid tubercle of the clavicle as its attachment point on the posteromedial side.

The trapezoid ligament extends superiorly from the coracoid process of the scapula to the

underside of the clavicle. Compared to conoid ligament its insertion is present on the anterior and lateral and it is behind the insertion of tendon of pectoralis minor muscle.

3. BLOOD SUPPLY OF ACROMIOCLAVICULAR JOINT:

Blood supply to acromioclavicular joint is by Suprascapular and Thoracoacromial arteries.

4. NERVE SUPPLY OF ACROMIOCLAVICULAR JOINT:

Nerve supply to acromioclavicular joint is by Branches from the suprascapular and lateral pectoral nerves.

5. MOVEMENTS AROUND AC JOINT:

There is no pure AC joint motion and the movement of clavicle at AC joint is along with scapulothoracic motion. The clavicle at AC joint rotates about 40 degrees superiorly synchronously with scapulothoracic movement.

ACROMIO-CLAVICULAR JOINT ANATOMY

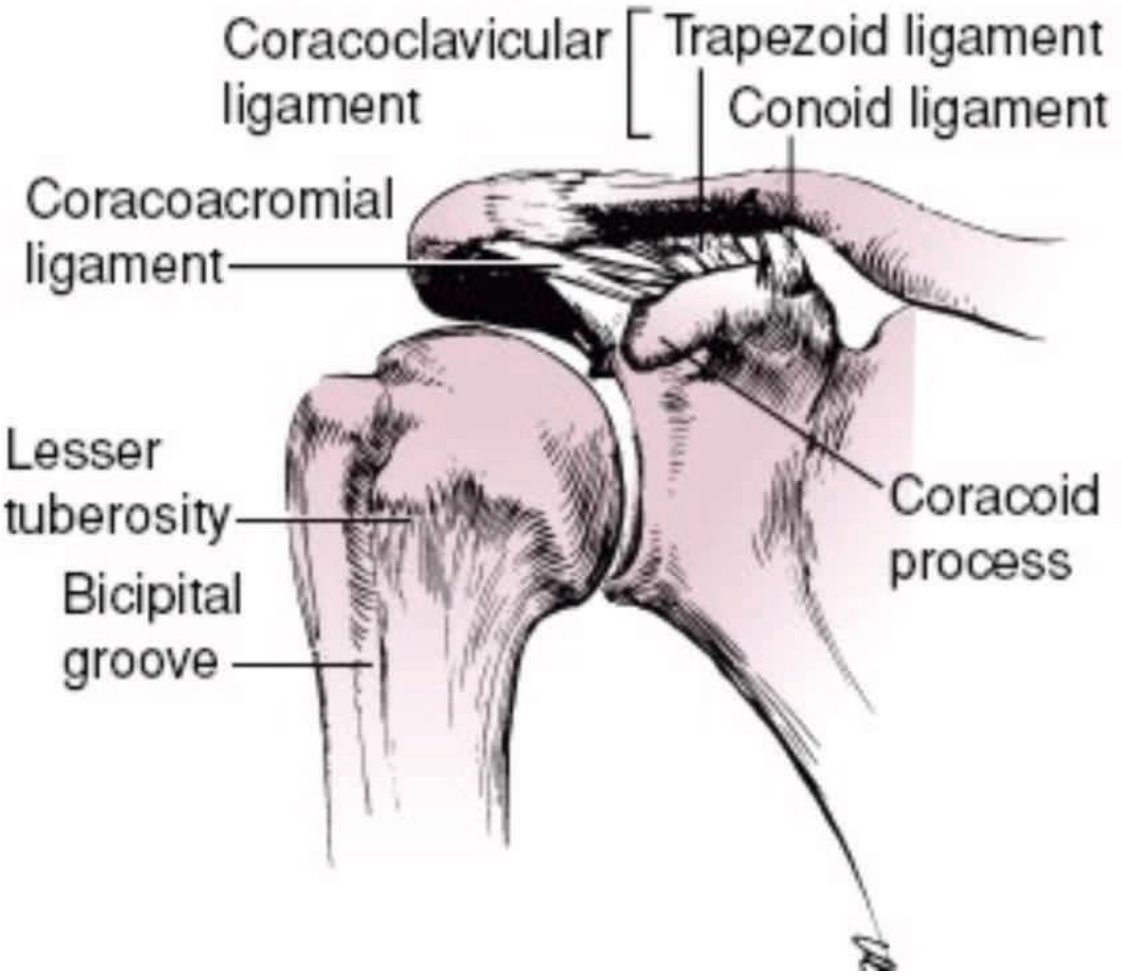


Figure 1: Anatomy of Acromio-clavicular joint

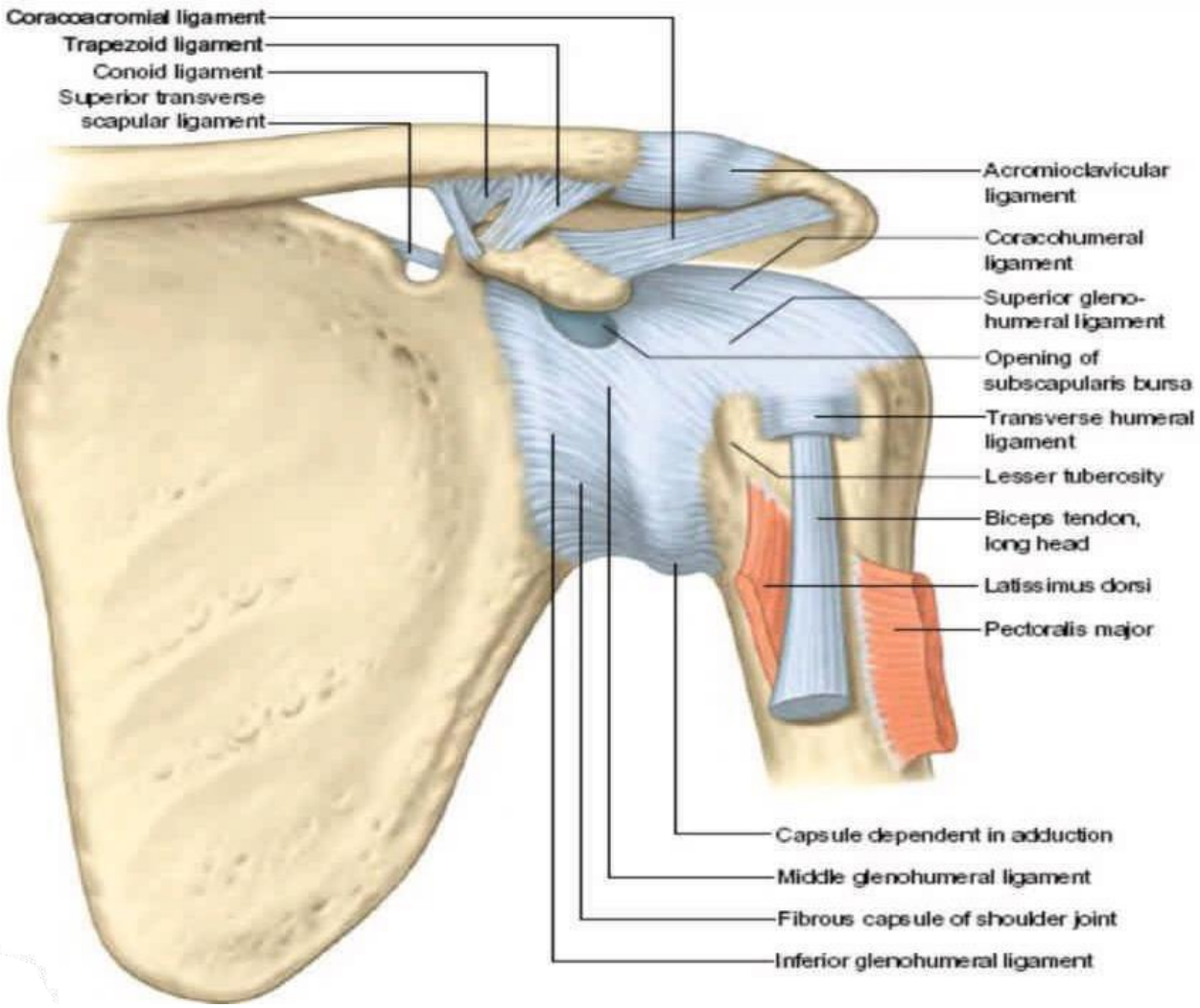


Figure 2: Anatomy of Acromio-clavicular joint

BIOMECHANICS

The mechanics of acromio-clavicular joint has two components: a dynamic component by scapulothoracic muscles and static component by the strong coracoclavicular and acromio-clavicular ligaments. Strong SC ligaments hold the clavicles suspended from the torso in the same way as the wings of an aeroplane are kept upright.

The trapezoid and conoid ligament provide support for the arm that is hanging from the distal clavicle. As a result, these ligament acts as the upper limb main suspensory ligament.

The acromio-clavicular joint capsule and ligaments, together with the coraco-clavicular ligaments (conoid and trapezoid), primarily stabilize the acromio-clavicular joint. Only when the coraco-clavicular ligaments are torn does the clavicle move vertically.

According to load-displacement studies conducted by Fukuda et al., the acromio-clavicular ligaments hinder the clavicle's ability to translate posteriorly (by 89%) and superiorly (by 68%) at minor displacements. The conoid ligament is the predominant constraint for superior translation (62%) while the acromio-clavicular ligaments are the primary restraint for posterior translation (90%) at significant displacements.[12]

The trapezoid ligament serves as the main barrier preventing compression of the acromio-clavicular joint at both major and minor displacements.

In regards to the acromio-clavicular joint, these studies have produced the following findings: "The acromio-clavicular ligament and capsule provide horizontal support, whereas coraco-clavicular ligaments provide vertical stability."

MOTION AT THE ACROMIO-CLAVICULAR JOINT:

When the shoulder is elevated, the clavicle rotates 40 to 50 degrees superiorly, along with the scapula. Rockwood et al. showed that the clavicle may rotate only 5 to 8 degrees with respect to the acromion. According to Codman, this is known as "synchronous scapuloclavicular motion".

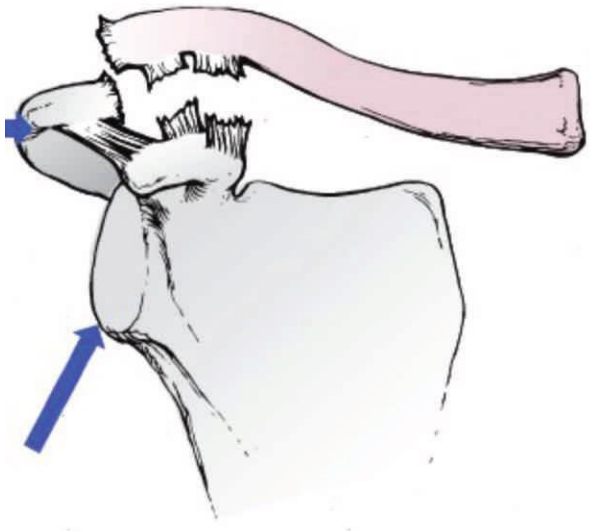
ACROMIOCLAVICULAR JOINT - MECHANISM OF INJURY

The force vector's size and direction determine the pattern of injuries that develops. Because the humeral head may enter the acromion superiorly after a fall onto an extended arm with elbow locked in extension, type 1 or 2 acromio-clavicular joint injuries may occur. Most frequent pattern of injury is when one falls on the lateral shoulder with arm in abduction. This causes a compressive (medial) and shear (vertical) stress to be applied on the joint.

The force that pushes the acromion beneath the clavicle, first tears the Acromio-clavicular ligaments, then the coraco-clavicular ligaments, and soft tissue covering over other structures. With this injury, the clavicle no longer acts as a suspensory support for the upper extremity; instead, gravity causes the scapula and associated glenohumeral articulation to shift inferiorly. Even though the contraction of the trapezius muscle may cause the clavicle to move upward, the downward displacement of the arm is essentially the distinguishing anatomic trait. This form of acromio-clavicular joint dislocation, along with arm abduction and scapula retraction, are extremely uncommon.

Figure 3: INJURY MECHANISM OF ACROMIO-CLAVICULAR JOINT

Figure 4: FORCE VECTOR'S DIRECTION



CLASSIFICATION - ACROMIO-CLAVICULAR JOINT DISRUPTIONS

The type of force that caused the injury determines how AC joint injuries are classified. The degree of ligament damage to the AC and CC depends on how severe the AC joint injury is. The frequently used classification, the Rockwood classification, is based on the work of Tossy et al.[13,14] This classification method is based on the injury's anatomical severity. Both subacromian and subcoracoid dislocations cause disruption of the AC ligaments, but subacromial dislocation preserves the CC ligament, whereas subcoracoid dislocation completely destroys it. The integrity of the deltoid and trapezius muscles is determined by the amount of clavicular displacement in the same way.

ROCKWOOD AND GREEN CLASSIFICATION OF AC JOINT DISRUPTION

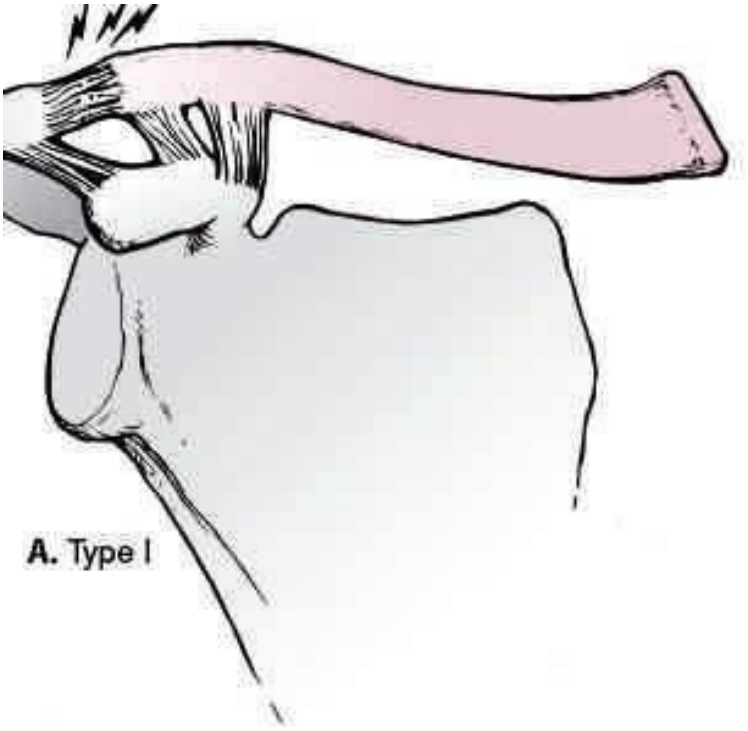


Figure 5

Type I AC JOINT DISRUPTION - The fibres of the AC ligaments are mildly strained by a little force applied to the shoulder. The AC joint is stable, and the ligaments are still intact.

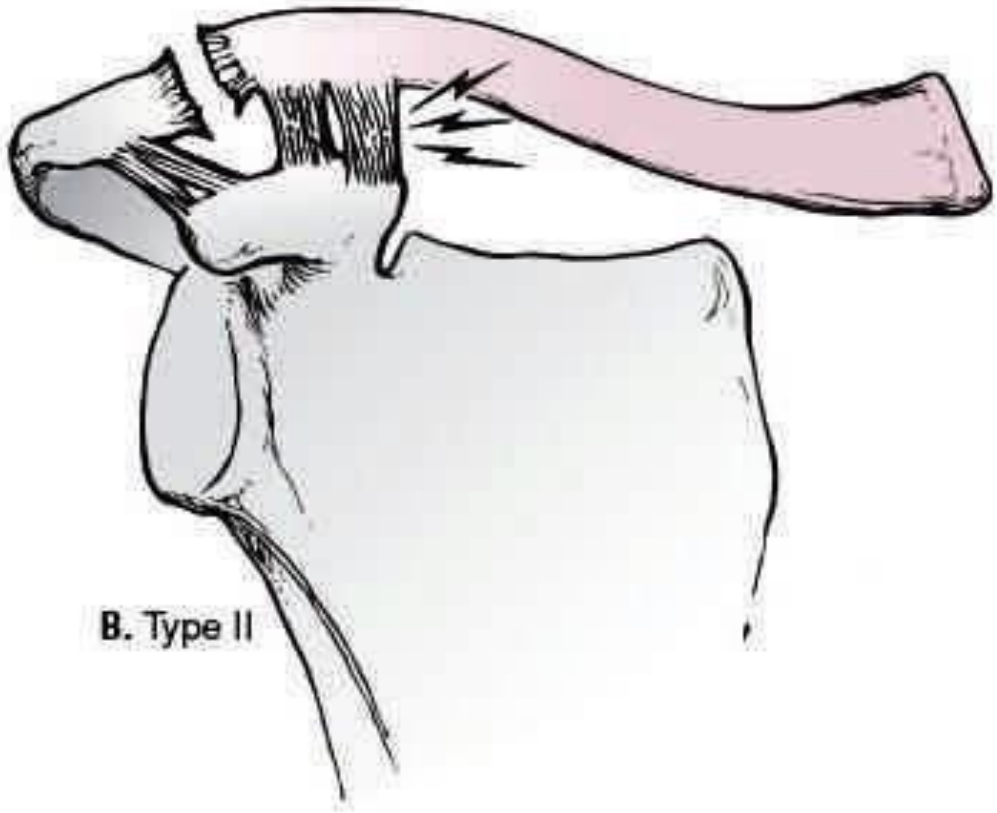


Figure 6

Type II AC JOINT DISRUPTION - The ligaments of the AC joint can be torn by a mild force applied to the shoulder. Although the lateral end of the clavicle is unstable in the horizontal plane, the damaged and intact coracoclavicular ligament maintains vertical (i.e., superoinferior) stability. The AC joint gap may increase as a result of the scapula rotating in a medial direction.

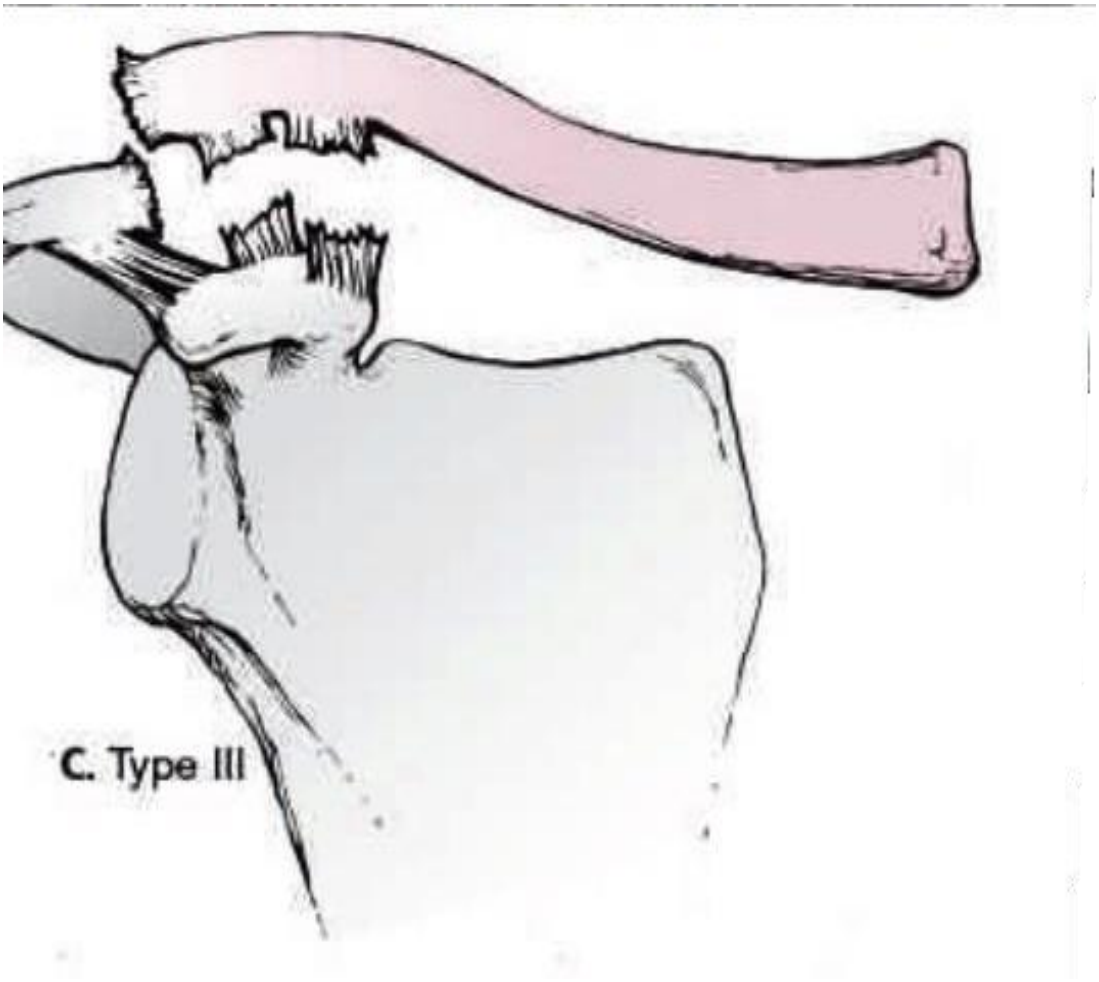


Figure 7

Type III AC JOINT DISRUPTION - The AC and coracoclavicular ligaments are torn when a strong force acts on the shoulder joint, which causes a full Acromioclavicular joint dislocation. The scapula and the shoulder complex droop inferomedially, giving the impression that the distal clavicle is shifted superiorly. The coracoclavicular gap is 25–100% larger on radiographs than it is on a sound shoulder.

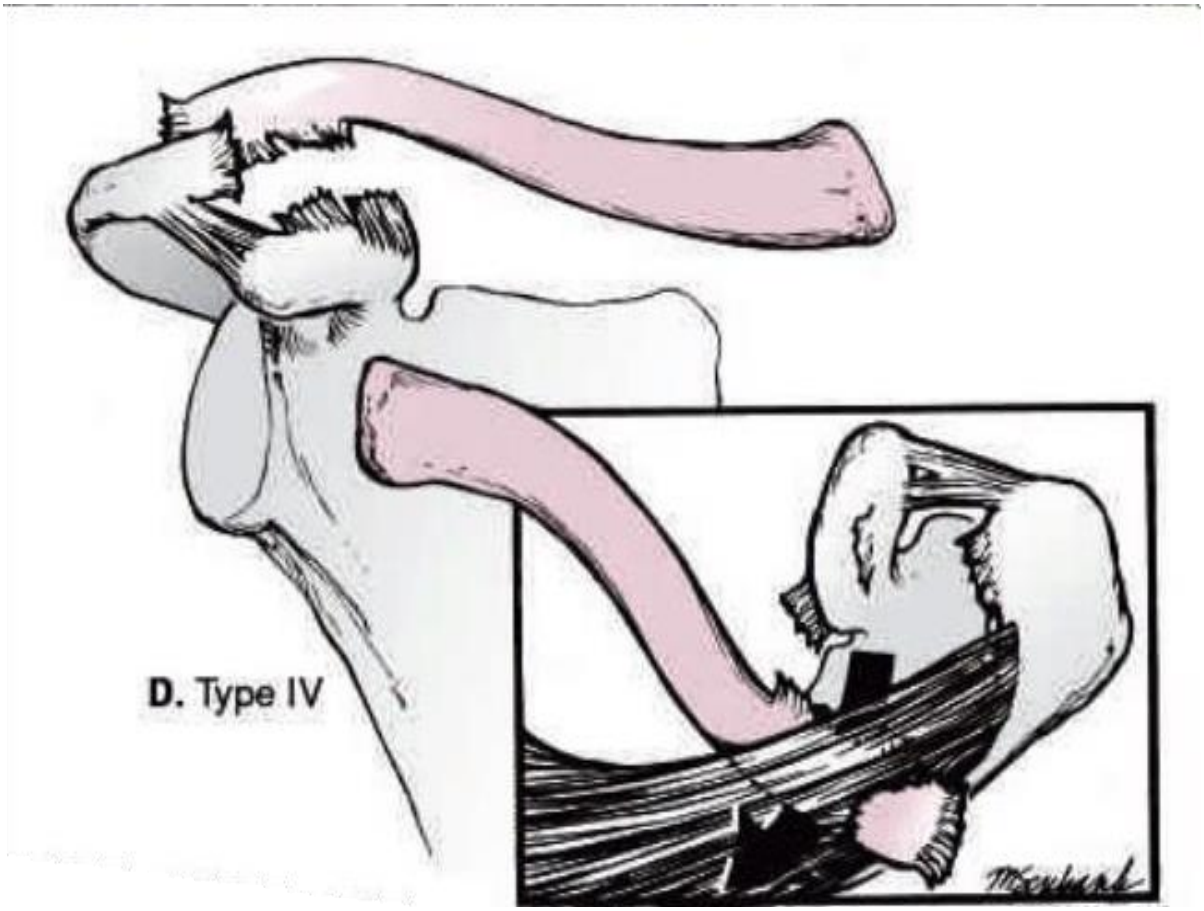


Figure 8

Type IV AC JOINT DISRUPTION - A type IV AC dislocation, or posterior dislocation of the distal end of the clavicle, is rather uncommon. When force is acting on the acromial process of scapula, scapula is forced anteriorly and inferiorly, posteriorly dislocating the clavicle into or through the trapezius muscle. When the clavicle is displaced posteriorly, there will be tenting of skin behind the shoulder.

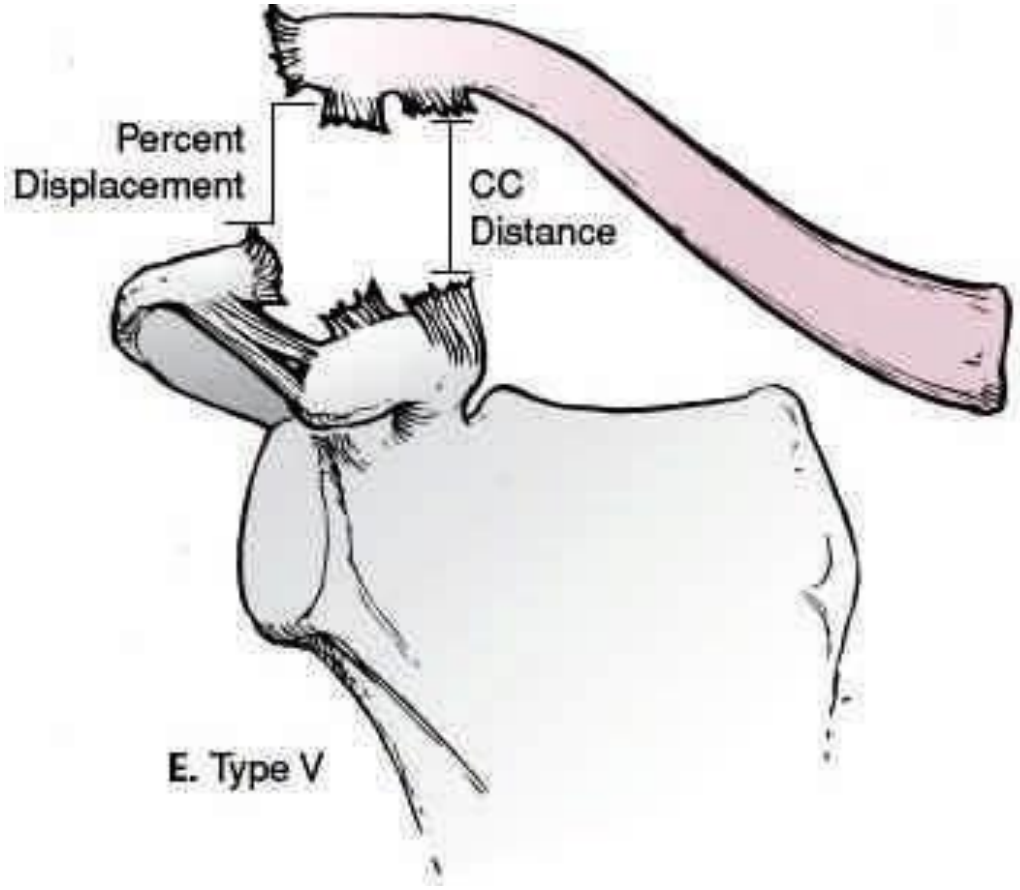


Figure 9

Type V AC JOINT DISRUPTION - A noticeably more serious variation of the type II injury is the type 5 AC joint dislocation. The deltotrapezial muscle attachments, the AC ligaments, and any other soft tissue attachments have all been removed from the distal clavicle, which now sits subcutaneously. When the significant downward droop of the extremity is paired with the superior displacement of the clavicle brought on by the sternocleidomastoid muscle pulling without resistance, the shoulder is noticeably deformed. In compared to the opposite, sound shoulder, the coracoclavicular space is expanded by more than 100% on radiographs.

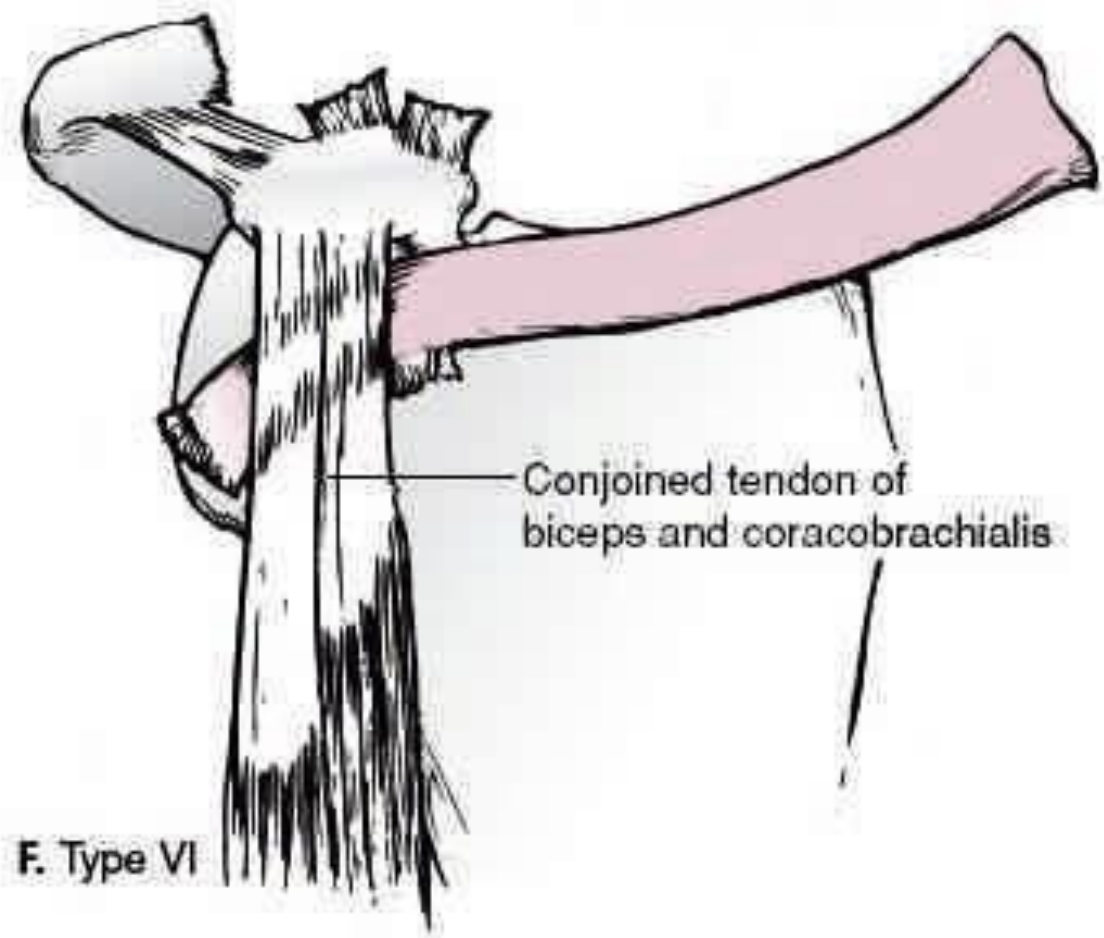


Figure 10

Type VI AC JOINT DISRUPTION - A very uncommon injury is inferior dislocation of the distal clavicle. The damage is typically the consequence of severe trauma, and numerous injuries are frequently present as well. Severe hyperabduction, external rotation of the arm, and scapula retraction all contribute to dislocation. Either the subacromial space or the subcoracoid space is occupied by the distal clavicle.

IMAGING

a) Shoulder AP view:

The patient is put in standing or sitting position with their upper limbs at their sides & their backs resting on the X-ray cassette for standard AP pictures. Imaging of both AC joints simultaneously is recommended. It is challenging to assess AC joint injuries due to the scapular spine's superimposition on the distal part of the clavicle and the acromial process of scapula. Distal clavicle fractures are easily overlooked. Zanca view is taken by employing a 10-15 degrees cephalic tilt. This cephalic tilt standardizes the coracoid-clavicle distance, which seems to increase with increasing anteroposterior view. It is the standard view to assess acromio-clavicular joint problems.

b) Axillary lateral views:

When there is a chance of an AC dislocation following a shoulder injury, an axillary lateral view is crucial. The cassette is placed on the medial side. The coracoid's small fractures and the clavicle's posterior displacement are seen in this image.

c) Stryker Notch view:

The Stryker notch view, the best view for evaluating injury, shows the coracoid in profile. The patient is lying face down with the palm of the raised arm behind the head in order to perform this. It could be difficult to get a clear picture if any external injuries are present.

d) Normal acromio-clavicular Joint:

The acromio-clavicular joint is 1-3mm wide in the coronal plane. When a patient is over 60 years old, the AC joint space diminishes; if it is 0.5 mm or less, it is said to be normal; if it is >7 mm in males and >6mm in women, it is said to be abnormal. The CC interspace varies greatly amongst people. Typically, there is 1.1 - 1.3cms between the clavicle and the coracoids. If the coraco-clavicular distance grows by 50 percent compared to sound side, complete AC dislocation is diagnosed. Complete AC dislocation results in a little increase in the CC distance of roughly 25%.[15,16]

Figure 11: ZANCA VIEW OF SHOULDER

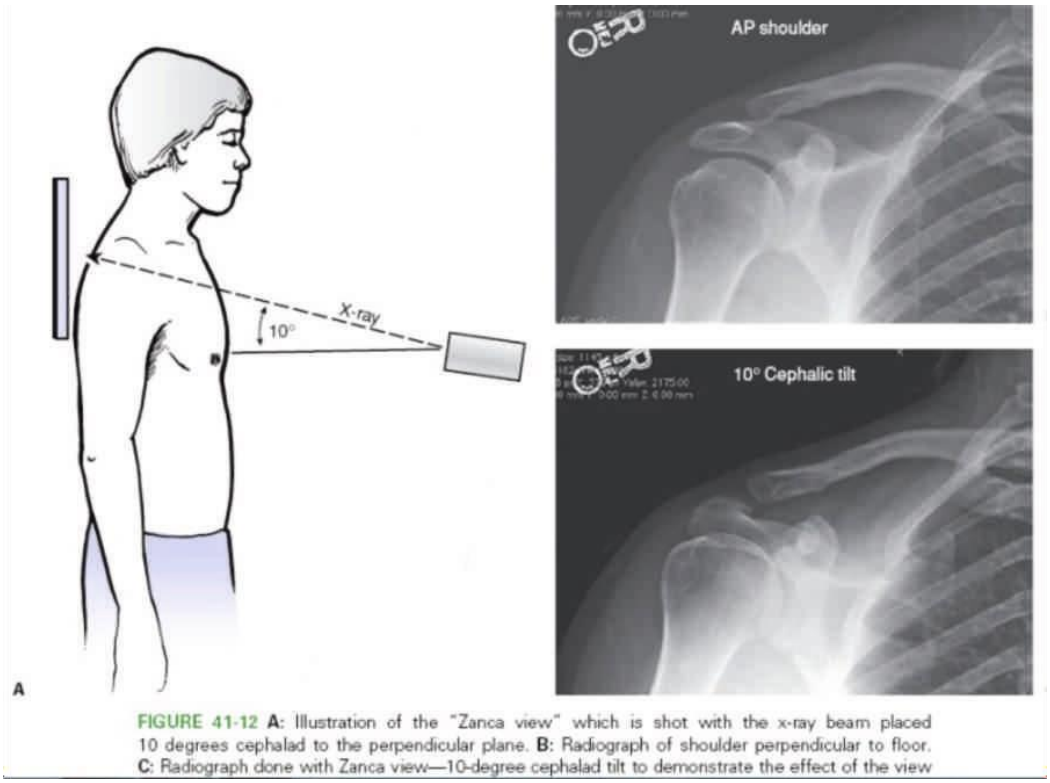


FIGURE 41-12 **A:** Illustration of the "Zanca view" which is shot with the x-ray beam placed 10 degrees cephalad to the perpendicular plane. **B:** Radiograph of shoulder perpendicular to floor. **C:** Radiograph done with Zanca view—10-degree cephalad tilt to demonstrate the effect of the view

Figure 12: STRYKER NOTCH VIEW OF SHOULDER JOINT

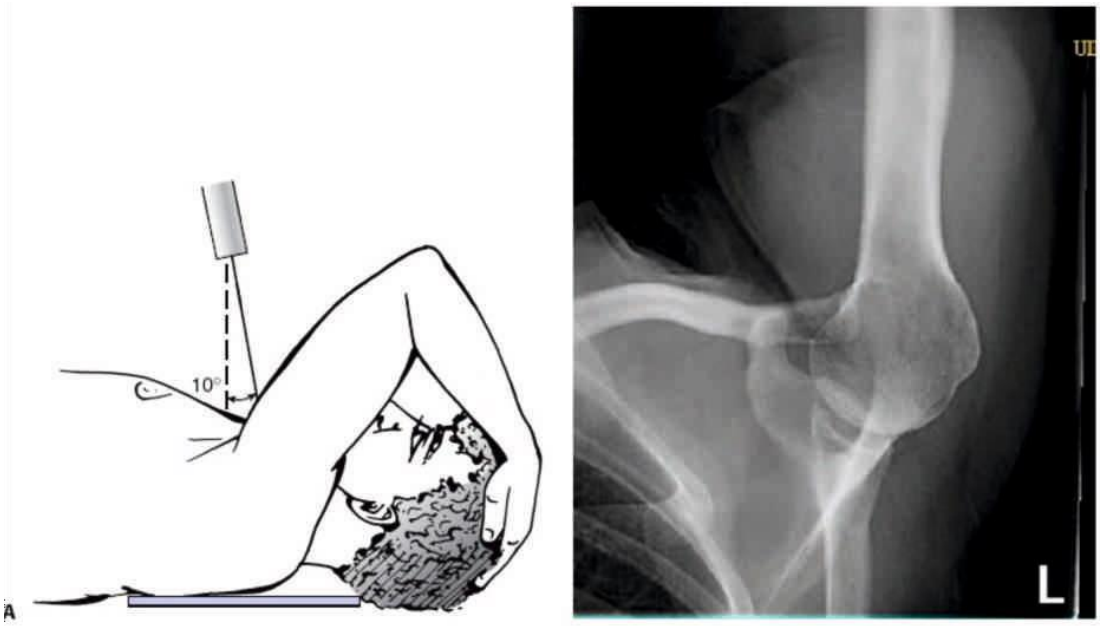


FIGURE 41-13 **A:** Illustration of positioning for the Stryker notch view. **B:** Stryker notch view radiograph of a patient. Note the view of the coracoid base where a fracture could be visualized.

TREATMENT OF ACROMIO-CLAVICULAR JOINT DISRUPTION

A. NONOPERATIVE TREATMENT:

The majority of experts agree that nonoperative therapy is preferable for Rockwood type I and II AC joint disruptions.[17,18] After a brief period of immobilization, Rockwood type 1 and 2 acromioclavicular joint disruptions are treated in the acute setting. Despite being at opposite ends of the spectrum, Rockwood type 1 and 2 acromioclavicular joint disruptions can have symptoms that endure for a long time. Patients with Rockwood type 1 and 2 acromioclavicular joint injuries will have symptoms for long duration because of variety of reasons, including post-traumatic arthritis of acromioclavicular joint, post traumatic osteolysis of clavicle, recurrent subluxations of joint, tears of capsular ligament, loose fragments of articular cartilage. Compared to Rockwood type I & II AC joint disruptions, type III AC joint injuries are more debatable when it comes to the best course of therapy since it can be challenging to distinguish type III from type V AC joint injuries.[19] When compared to the opposite shoulder, type III AC joint disruptions exhibit superior displacement ranging from 25% to 100% and totally ruptured AC and CC ligaments. Full thickness tears of the acromioclavicular & coracoclavicular ligaments, tears of the delto-trapezial fascia, and >100 percent upward migration in relation to normal shoulder are all characteristics of type V AC joint injuries. The 1930s and 1940s saw a predominance of conservative therapy for type III AC joint problems.

With improvements in surgical skill from the 1950s through the 1970s, operational correction emerged as the standard treatment for these displaced AC injuries. Cox et al. surveyed two groups of orthopedists in the early 1990s: one group of orthopedists with a focus on sports medicine and another group of directors of orthopaedic residency programmes.[19,20] 86.4% of sports medicine specialists and 72.2% of orthopaedic residency programmes chose conservative management for type 3 acromioclavicular joint problems. Recently, Nissen and Chatterjee, who are both resident directors

for orthopaedic surgery programmes and members of AOSSM, developed a preference for nonoperative treatment of type III AC joint disruptions.[21]

Patients were treated surgically with reduction and fixation with a CC screw in a prospective randomized trial by Bannister et al., or nonoperatively for 14days with arm sling pouch, and then same physiotherapy as of the surgical group. Following a four-year period of observation, the nonoperatively treated group showed better functional recovery, quick return to office/work and their daily activities, and minimum subpar outcomes. But examining a small group of patients with acromioclavicular joint disruptions with a displacement >2cms revealed that the surgically treated group had superior outcomes.

Patients were randomly assigned by Larsen et al. to receive either nonoperative care with arm sling pouch or surgical care by the Phemister procedure, which involves reducing and stabilizing the AC joint with the help of 2 threaded 2mm K-wires that cross joint-space, and suturing of torn acromioclavicular & coracoclavicular ligaments & surrounding soft tissue. The results of this study showed that the nonoperatively treated group required less time for rehabilitation and that the surgically treated group has higher rate of complications, 50% of surgically managed patients facing issues with metallic implant or superficial infections. There was no difference in the clinical outcomes between the surgical and nonsurgical groups. More thought is devoted to the surgical care of polytrauma patients with AC joint disruption.

According to disease-specific and overall health outcomes, the Gallay et al. research on a patient with polytrauma demonstrated that AC joint injury has larger effects on shoulder function.[22]

Operative treatment is often used to treat AC joint disruptions of grades IV, V, and VI, with special focus on soft tissue injury and chronically displaced joints.

Injury to the AC is treated non-operatively with skillful neglect and an immobilization device. Immobilization tools came in a wide variety of forms, including arm sling, casts, braces,

harnesses, traction techniques, and sticky tape strappings. One of these immobilization tools utilized as a conservative therapy strategy is the sling. The idea behind the immobilization technique is to support the weight of the upper limbs to relieve some of the pressure on the ligaments surrounding the joint. In a nutshell, during the initial 7 days of therapy, the shoulder arm immobilizer, with icepack application, medicines, helps to decrease pain and swelling brought on by the AC joint damage. From the time of injury, the degree of dislocation and harm to the AC joint complex are both continuous. The objective of acute phase treatment is to reduce pain.

After the initial period of rest & immobilization, for 1-2 weeks based on the severity of the acromio-clavicular joint disruption, physiotherapy is done. Strengthening activities are performed during the 2nd phase of therapy in place of both heavy lifting and contact sports.

Gladstone and colleagues (11) described a four-phase rehabilitation program:

Phase 1, pain control and immediate protected range of motion and isometric exercises;

Phase2, strengthening exercises using isotonic contractions and proprioceptive neuromuscular facilitation exercises;

Phase 3, unrestricted functional participation with the goal of increasing strength, power, endurance, and neuromuscular control;

Phase 4, return to activity with sport-specific functional drills.

Most patients are able to return to normal activity in 2 to 4 weeks.

An athlete is ready to return to competitive sports once the following criteria are met:

1. Full range of motion, no pain or tenderness,
2. Satisfactory clinical examination, and
3. Demonstration of adequate strength on isokinetic testing

Most athletes are able to return to play in 2 to 4 weeks but other authors reported that some require up to 12 weeks (2)

Numerous studies have compared nonsurgical therapy for AC joint disruptions versus surgical treatment. Galpin et al. evaluated nonoperative therapy of full AC dislocations with surgical

treatment using a Bosworth CC screw in one of the first comparative trials. In terms of early return to activities and sports, and employment, the nonoperatively treated group showed equivalent, if not greater, results in this research. ROM and muscle power were found to be equivalent in both groups.[23]

Gstettner et al. compared patients with grade III AC joint disruption who had surgical treatment with a hook plate to those who received conservative care after a mean follow-up of 34 months. In the group that underwent surgery, the Constant Scores were improved.[24]

No appreciable differences in outcomes between surgical and nonsurgical therapy of type III AC joint disruptions were documented by Calvo et al. In addition, osteoarthritis and CC ligament ossification were much more common in the surgically treated AC injuries.[25]

Both surgical and nonsurgical therapy, according to Press et al., are beneficial, although nonsurgical treatment allows patients to return to work and sports sooner. When the two groups shoulder joint ROM, muscular strength, and neurovascular findings were examined, no noticeable changes were observed.

The idea of the superior shoulder suspensory complex (SSSC) was defined by Goss. The acromial process and coracoid process of scapula, the distal end of the clavicle, coracoid ligaments, and the soft tissue portion of the acromioclavicular joint work together to form the ring.

Damage to SSS complex must also result in disruption of a different section of the osteoligamentous ring, causing what are known as double disruptions, similar to the pelvic ring.

Since both AC and CC ligaments are damaged, all grade 3 through grade 6 disruptions fall into this group. These kinds of wounds can have unfavourable long-term implications on functional outcome. It is recommended that these disruptions be taken into consideration for surgery.

B. OPERATIVE MANAGEMENT

Indications & contraindications:

It is important to note that recent research of people with type III injuries found a connection between changed shoulder biomechanics associated to total AC joint dislocation and scapular dyskinesis, which eventually leads to SICK scapula syndrome (scapular malposition, inferior medial border prominence, coracoid discomfort and malposition, and dyskinesis of scapular movement). 54% of individuals with chronic type 3 acromio-clavicular joint dislocations has this syndrome. Surgery is often the treatment of choice for active, healthy people with full acromio-clavicular joint injuries since the damage pattern may cause continuous dislocation, unstable acromio-clavicular joint.

Historical and Classic Techniques:

There is a definite historical progression for the surgical treatment of AC joint dislocations. One of the earliest methods to be documented was transarticular fixation of the AC joint with pins or wires. Fixation was designed to improve temporary reduction, enabling native soft tissue to recover while the AC joint was in a reduced position. However, this method was abandoned due to reports of fixation failure, loss of reduction, and terrible hardware migration. Similar to this, the 1941 invention of the Bosworth screw suspension method served as an extra-articular transitory fixation tool for acute, reducible AC joint dislocations. It was intended to offer sufficient support for CC ligament repair or scar formation. Hardware failure, migration, and coracoid fractures have been recorded with this construct for a number of reasons, including the difference between the stiff fixation given by the screw and the inherent motion between the clavicle and the coracoid process of scapula. Later, alternative CC suspension methods including Dacron grafts, wires, and different kinds of sutures started to show up in the literature. The idea was to offer enough fixation to hold the CC distance decreased and enable AC and CC ligaments healing while yet allowing for motion with a less stiff design.

Weaver and Dunn first described their technique of distal clavicle removal and transfer of coracoacromial ligament to the distal part of clavicle in 1972 to repair and reconstruct the coracoclavicular ligaments and treat both acute and chronic AC joint instability. This approach has undergone various modifications over the years. The detached CA ligament is used as a holding framework for the distal clavicle in this open procedure, which constitutes a technique. This nonanatomic approach is modified by adding a new suture construct for greater primary stability. Even though it is less effective biomechanically than the other approaches, this method is nonetheless frequently used to reconstruct the CC ligaments along with various technical alterations. The initial strength of the CA ligament after transfer has been proven to be just 25% of the normal, intact CC ligaments, and it does not restore horizontal plane stability, despite satisfactory to excellent results of this treatment having historically been reported in 75% of cases.

In a recent cadaveric model, it was discovered that the modified Weaver-Dunn had a 39% lower ultimate load to failure than the control. Up to 30% of the time with this treatment, recurrent instability has been recorded, often at the AC joint in the anterior-posterior direction. From a biomechanical perspective, the AC ligaments part in controlling superior and horizontal translations has been demonstrated. AC hook plates have been researched with varied degrees of effectiveness in the literature since the 1980s. The plate has undergone certain modifications to include locking screw technology. This technique elevates the glenohumeral joint and hooks under the acromion to keep the clavicle in a reduced position. The majority of documented cases involving the use of superior clavicle hook plates include individuals who have persistent dislocations, frequently in conjunction with AC joint arthrosis. There is recorded evidence of acromial fracture or erosion, hardware irritability, and success rates of 60% to 94%. Due to these issues, it could be necessary to remove the plate or the tab on the distal end that articulates beneath the acromion. In a recent retrospective study, constructions with braided PDS no. 1 suture inserted around the coracoid and hook-plates were compared to treat chronic AC dislocations. There was a tendency for lower Constant Scores in the individuals treated with hook plate augmentation after the plates were removed, even though the research lacked the necessary power to detect significance. The hook plate group, on the other hand, was more uncomfortable all around, and each one required surgery to be removed. According to recent findings, hook plates can also result in acromial osteolysis, fractures, and persistent discomfort in the subacromial region that demands plate removal and leads to a persistent pain condition.

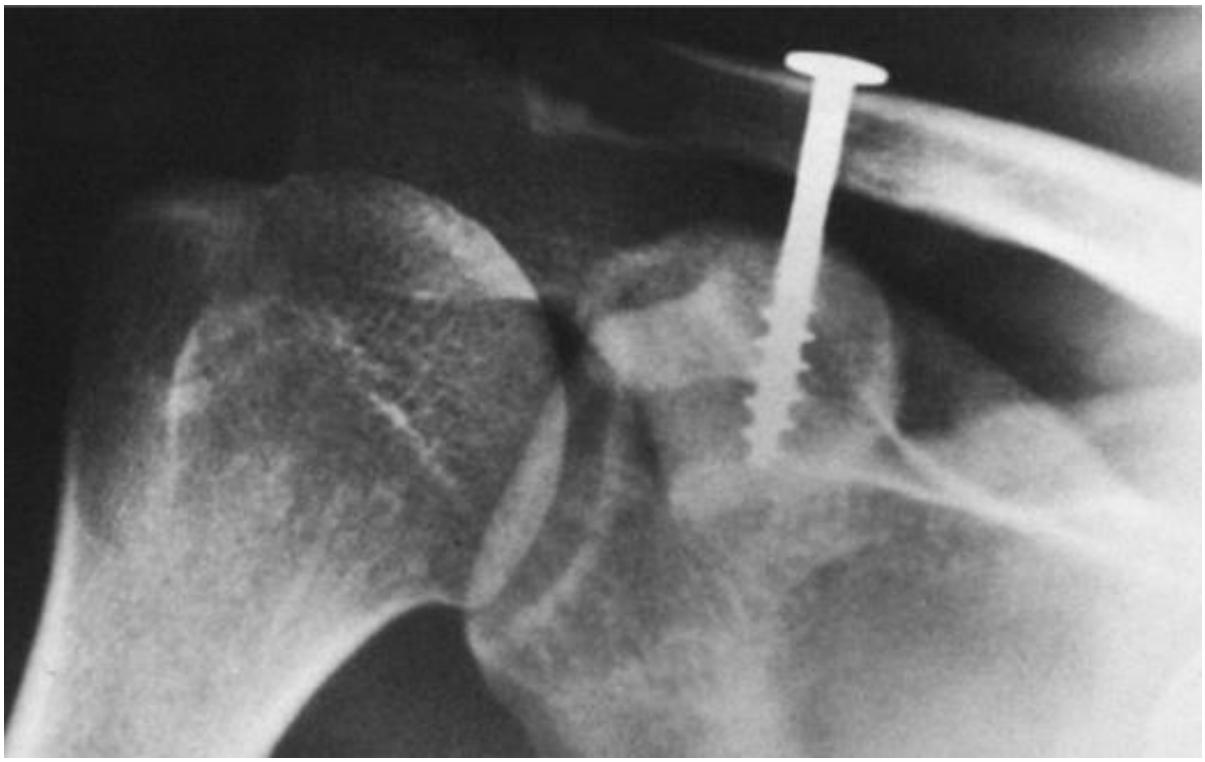


Figure 13: Post-op AP radiograph of the shoulder joint with Bosworth screw in place.

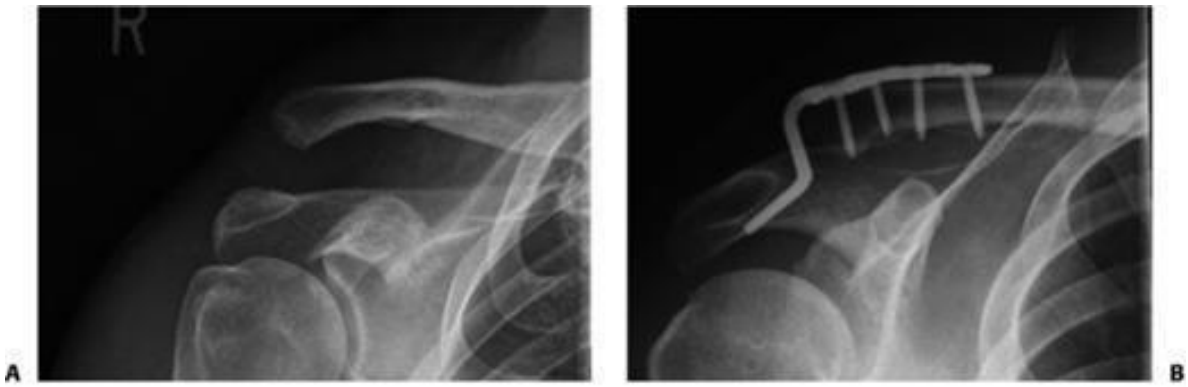
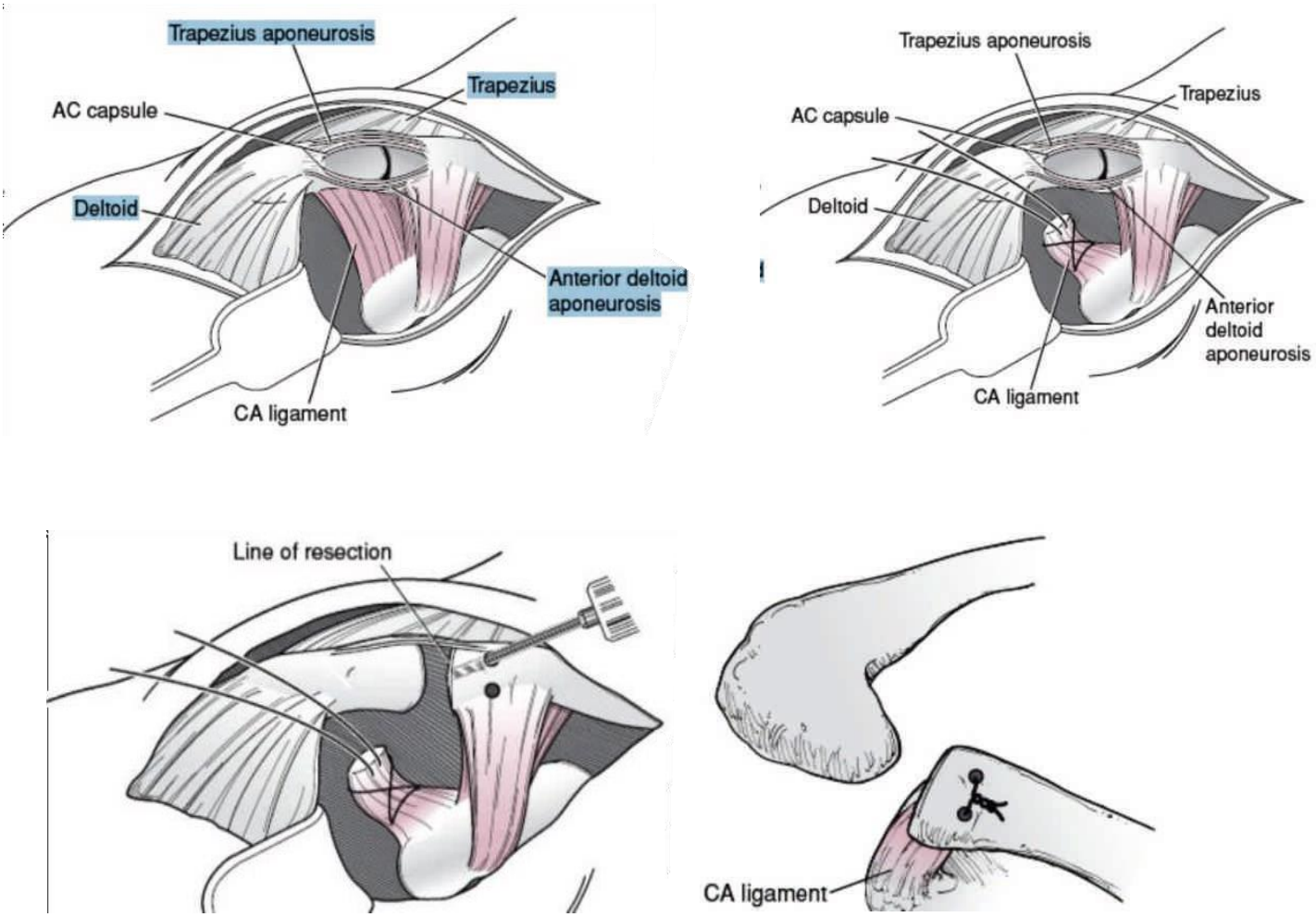


Figure 14: (A)Radiograph of a high-grade AC joint dislocation and

(B)Following hook plate fixation, anatomical alignment is restored.

Figure 15: WEAVER-DUNN PROCEDURE.



Patient positioning:

Patient is put in beach chair position with the hip in slight flexion. In order to reduce the scapula to the clavicle, it is now simpler to expose and move the shoulder. The scapula will not protract if a little sand bag is placed in the interscapular area. This also elevates the trunk off the table, which facilitates drilling bone tunnels through clavicle.

The patient is held in place with a safety belt and three-inch cotton tape wrapped across the chest. A few inches behind the rear of the clavicle and from the sterno-clavicular joint till nipples and from neck till base of the ear, should be draped to provide a sizable operating field. The image intensifier is set up for intraoperative imaging prior to preparation. In order to estimate the intact CC distance, a comparative Zanca image of the typical AC joint is created.

Figure 16: BEACH CHAIR POSITION

Figure 17: SURFACE MARKING

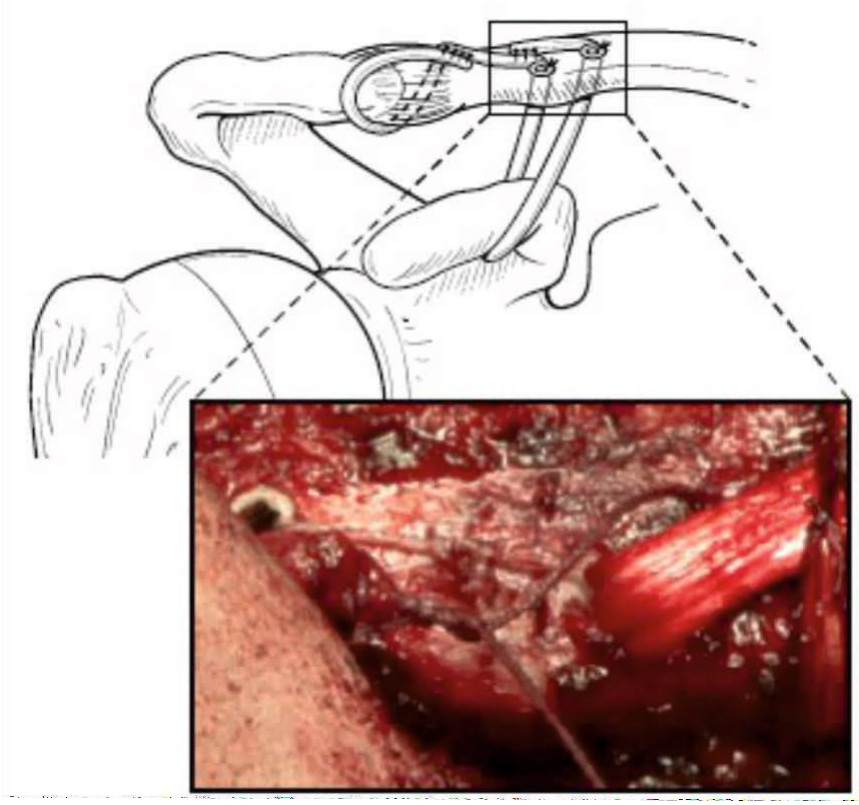


Figure 18: FIXATION

Management of Acromioclavicular Joint Injuries: Anticipated Adverse Outcomes and Unforeseen Complications

Most commonly, the acromioclavicular joint, sternoclavicular joint, or clavicle shaft are damaged when an inferior and medial force is given to the dorsal aspect of acromial process of scapula. Also documented are combination injuries. AC joint dislocation and clavicle fracture have been documented by "Wurtz et al.166 and Lancourt." Many people have experienced simultaneous dislocations of the acromioclavicular joint and sternoclavicular joint ends of the clavicle, sometimes known as "bipolar" dislocations.

Typically, an anterior SC dislocation is coupled with a posterior / type IV AC dislocation upon injury. As a result, it is crucial to thoroughly assess any patient who has suffered an injury to the AC joint while also paying close attention to the sternoclavicular joint. Due to the surgical management of AC dislocations, there are numerous complications. Many specific consequences arise from the surgical technique in addition to general ones like infection and osteomyelitis like drill hole fracture, loss of purchase of the internal fixation, metal failure, and migration of the fixation device to other areas of the body.

a) Acromioclavicular Joint Injuries: Pin Migration

Pins used for stabilizing the acromio-clavicular joint can move further down to dangerous organs such as lungs, cord, anterior to carotid-sheath and vessels, and pleural coverings. The migrating pin in the thorax and neck penetrates vessels, causing damage (more historical at this point). To prevent further pin movement, the pin is bent.

However, a part of the pin migrates if the pins break. Patients must be informed and prepared

for the possibility that a pin removal is necessary, as well as the consequences that could result if the pin is not removed. Lyons and Rockwood evaluated 37 cases of pin migration following shoulder operations and advised against putting pins there. If pins are employed, the possibility of migration should be reduced by either bending the pins or using restraint devices on them. The dangers associated should be explained to the patient. Patients should be closely watched, and if migration occurs, the pins should be removed sooner rather than later.

b) Acromioclavicular Joint Injuries: Soft Tissue Repair Failure

Without coracoclavicular sutures, screw fixation, or internal fixation, simple repair of the coracoclavicular and acromioclavicular ligaments will not be able to address ligamentous injury to the acromioclavicular joint. Since there is typically a sizable gap between the clavicle and the coracoid process of scapula, this is particularly true if the AC joint injury is longstanding. In general, the Weaver-Dunn approach, which involves moving the coracoacromial ligament's acromial attachment onto or into the distal section of the clavicle's medullary canal, is insufficient. As in the therapy section, supplementation with extra fixation is advised. Soft tissue failure can be brought on by suture breakage, anchor pullout, or screw fracture. Resurgery is performed to fix the issue if the failure is discovered early in the healing process.

c) Complications associated with ACCR Technique:

It is becoming increasingly common in the literature to treat severely dislocated or persistent acromioclavicular joint dislocations using allograft tendons to reconstruct coracoclavicular ligaments, however there are drawbacks.

This is highlighted by the three clavicle fracture instances that Turman et al. recently described following AC joint repair. According to the findings, three of the seven patients who received CC ligament restoration had a clavicle fracture.

Each patient had a Type V injury, and two of them underwent acute reconstructions (approximately six months after the accident), while the third underwent surgery two years post injury. According to the research, the procedure's failure may be connected to tunnel size over the clavicle and the lack of acromio-clavicular joint ligaments restoration or rebuilding. The natural or repaired CC ligaments are subjected to increased force when there is posterior movement at the acromio-clavicular joint. In addition to the osseous architecture of the clavicle and bone density in connection to fracture risk for bone tunnel location and diameter, wide bone tunnels have also been described as a second type of potentially catastrophic failure.

d) Complications of Nonabsorbable Tape or Suture:

Numerous difficulties can arise during CC fixation when grafts or artificial material are used. Dacron graft erosion has been described in the series by Goldberg et al. across the distal end of the clavicle.

Moneim and Balduini discovered a coracoid fracture following the reconstruction of the coracoclavicular ligaments using two holes drilled in the distal part of the clavicle. According to observations, placing loop sutures between both the coracoid and the distal part of clavicle causes subsequent distal clavicular fractures. Aseptic foreign body responses and infections are a couple of the additional risks.

Three examples where there was a clear connection between nonabsorbable tape or sutures and postoperative infections were documented by Neault et al. One incidence happened five years after repairing a type III injury, while the infection happened in two of the cases within a year.

e) Acromioclavicular Arthritis

Symptomatic arthritis may develop after AC joint surgical fixation. For acute and chronic acromioclavicular joint disruptions, "Weaver and Dunn" recommended coracoacromial ligament

transfer and distal clavicle resection.

In their study, Cook and Heiner suggested removal of the distal part of clavicle as a surgical treatment for individuals with acute AC joint disruptions. According to their report, 24% of patients with AC joint injuries experienced postoperative degenerative alterations, and primarily excising the distal clavicle was linked with minimal morbidity. On the other hand, primary resection of the distal end of clavicle is not advised, in contrast to numerous reported results of operative treatment for AC separations. Therefore, there is disagreement over the primary resection of the distal end of clavicle and transposition of the coracoacromial ligament in acute AC joint disruptions. Our standard procedure is to keep the AC joint articulated as much as feasible. To enable for reduction, the meniscus homologue and the scar that formed inside the dislocation space must be removed.

REVIEW OF LITERATURE

Based on Cadenat's 1917 work, Rockwood and Green described the development of historically recorded approaches for acromioclavicular joint repair.[9]

Following conservative care of type 3,4,5 acromioclavicular joint dislocation in an active young adult, Urist M. R. found 10% to 20% unsatisfactory outcomes in 41 cases.[26]

In a review of the literature, Kennedy and Cameron found that 20% of grade III AC joint dislocations treated nonsurgically had poor outcomes, including persistent discomfort, instability, and loss of shoulder range of motion.[27]

In a cohort of 30 patients with grade III acromioclavicular dislocations treated nonoperatively, Dawe observed that over 50% of them had discomfort severe enough to need employment changes or a break from contact sports.[27]

Samuel Cooper is credited with executing the first acromioclavicular joint procedure in 1861, repairing the joint using a wire loop. Procedures that described the direct repair of the acromioclavicular ligaments without treating the coracoclavicular ligaments were then described.[28]

In the latter half of the 19th century, Poirier, Rieffel, Tuffier, and Baum fixed the acromio-clavicular ligaments and joint capsule with sutures.[29–31]

The first person to integrate the restoration of the acromioclavicular and coracoclavicular ligaments was Baum, who did it in 1886.[30]

Paci pioneered arthrodesis of the AC joint in 1889. For acromio-clavicular joint fixation, Delbet[28] utilized a nail.[27,32]

In order to prevent stiffness and persistent discomfort, Morestin removed the lateral 2.5cms of the clavicle.[27]

Delbet made 1st attempt to repair the coracoclavicular ligaments, first using a silver wire and then with suture made of silk. Using a suture wrapped around the coracoid and placed in clavicular bone tunnels, Delbet carried out the first coracoclavicular reconstruction in 1917. Delbert utilised flexible suture loops because he thought a stiff repair of these structures was prone to failing.[28]

In 1928, Bunnel rebuilt the AC joint using a fascia lata. In 1929, Henry employed autogenous fascia lata together with two Kirschner wires.[33,34]

Bosworth first reported the method of simulating the CC ligament in 1941 by inserting a screw between the clavicle and the coracoid.[35]

Caldwell did arthrodesis of the acromio-clavicular joint as an option in his 1943 study.[36]

Bailey reported a coracoid process and a conjoined tendon that had been transplanted to the clavicle in 1964. Dewar and Barrington introduced their modified Bailey technique in 1965.[37]

Weaver and Dunn introduced an open approach for treating both acute and persistent acromioclavicular dislocations in 1972. The coracoacromial ligament is transferred to the distal clavicle's intramedullary shaft during a distal clavicle excision during this technique. The benefit of this method is that it recreates a coracoclavicular ligament using the transplanted coracoacromial ligament instead of fixing the acromioclavicular joint, which might lead to the onset of symptomatic acromioclavicular arthritis. In order to safeguard the ligament restoration, coraclavicular fixation with screws or strong sutures has been added to this technique.[10,11]

Balser introduced a novel idea on the application of a hook plate in the middle of the 1980s.[38,39]

Wolter later revealed his version of the hook plate in the late 1980s.[40,41]

Bateman used fascia lata and made new suspensory-ligament in an attempt to repair the CC ligament. Excision of the lateral end of the clavicle was indicated intraoperatively if the AC joint was discovered to be degenerative.[3]

In 1996, SU TI Han et.al; conducted a study on 20 patients with AC joint disruption, treated with modified neviaser method (fixation of AC joint, CC ligaments repair and transfer of anterolateral band of CC ligament) and concluded that this method provided the advantage of strong and stable fixation with a low complication rate.[42]

Churl-Hong Chun et al. carried out a study on The Surgical Treatment of Acromioclavicular Joint Dislocation using Modified Phemister and Modified Weaver-Dunn Operation in 1998 and came to the conclusion that the modified Phemister method was a successful treatment for elderly patients with acute injuries because of its quick recovery time and straightforward technique. The modified Weaver-Dunn approach proved effective for stabilising the coraco-clavicular ligament through clavicular bone union during reconstructive procedures for young, active male patients.[43]

Ashwin V. Deshmukh et al. concluded that supplemental fixation should be used during acromioclavicular reconstruction because it offers greater stability and pull-out strength than the Weaver-Dunn reconstruction alone. Their study was published in 2004 and tested the hypothesis that augmentative coracoclavicular fixation provides

better restoration of normal acromioclavicular joint laxity and an increased failure load when compared to the Weaver-Dunn.[44]

Keith M. Baumgarten et al. conducted research on arthroscopically assisted acromioclavicular joint repair in 2006 and came to the conclusion that it is more aesthetically pleasing from a cosmetic standpoint and patients have less postoperative discomfort.[45]

In their study on the Double Endobutton Technique for Repair of Complete Acromioclavicular Joint Dislocations, Steven Struhl et al. in 2007 came to the conclusion that the procedure is technically simple, employs a tiny incision, and requires little soft tissue dissection. While this research shows the validity of the surgery using an open technique, by switching to an arthroscopic approach, morbidity can be further decreased.[46]

A prospective study on the Semitendinosus Tendon Graft versus a Modified Weaver-Dunn Procedure for Acromioclavicular Joint Reconstruction was carried out by Mark Tauber, MD et al. in 2009, and the researchers came to the conclusion that the Semitendinosus Tendon Graft for coracoclavicular ligament reconstruction produced significantly better clinical and radiologic outcomes than the modified Weaver-Dunn procedure.[47]

L. Murena et al. carried out a study on the arthroscopic treatment of acute acromioclavicular joint dislocation with double flip button in 2009 and came to the conclusion that this method was safe and minimally invasive, delivered good aesthetic results, and allowed for the treatment of associated lesions. Additionally, the approach could profit from more sophisticated retention mechanisms, which should lessen or prevent the movement of the flip buttons.[48]

In 2010, Chad C. Zooker et al. conducted a study with the hypothesis that a Weaver-Dunn reconstruction enhanced with tight rope would provide the AC joint with superior superoinferior and anteroposterior stability as compared to

a Weaver-Dunn reconstruction enhanced with mersilene fibre tape cerclage. They found that tight rope augmentation reduced superoinferior and anteroposterior translation.[49]

Alexander Beris et al. concluded that the proposed mini-open technique had adequately exposed the base of the coracoid with little harm to the soft tissues surrounding the coracoclavicular ligaments while ensuring an excellent cosmetic outcome in their prospective series on the management of acute acromioclavicular joint dislocation with a double button fixation system published in 2013. For all type IV injuries, as well as type III injuries in heavy manual labourers and high-demand upper extremity athletes, they advise using this approach.[4]

Macro Spoliti et al. concluded that this method for treating acute acromioclavicular joint dislocations with the use of the TightRope device was minimally invasive and it allowed anatomic restoration of the acromioclavicular joint in a clinical series published in 2014 on minimally invasive stabilization of acute acromioclavicular joint dislocation treated with fiberwire and endobutton system. It is a fairly safe technique with excellent aesthetic outcomes that guarantees stable acromioclavicular joint restoration.[50]

A biomechanical assessment of a novel double endobutton technique versus a coracoid cerclage sling for acromioclavicular and coracoclavicular injuries was carried out by Cori Grantham et al. in 2014. The researchers came to the conclusion that the double endobutton technique produced less information about the AC joint and had better load-to-failure characteristics than the CS reconstruction. As a result, this method may be more effective than an allogenic graft design in restoring native AC-CC biomechanics, decreasing post-operative discomfort, and preventing repeated subluxation and dislocation. Regarding AC-CC injuries, the double endobutton method may be an appropriate choice.[51]

Steven Struhl et al. in 2015 came to the conclusion that the continuous loop device decreased the chance of knot slippage or breakage in their study on Continuous Loop Double Endobutton Reconstruction for Acromioclavicular Joint Dislocation. MRI results showed a strong healing response. The outcomes of the presented procedure were

noticeably better than those of previous reports of nonsurgical outcomes, and the technique is suitable for both acute and chronic dislocations.[52]

P. Loriaut et al. evaluated the minimally invasive management of acute acromioclavicular dislocations in 39 patients in 2015. At final follow-up, the mean QuickDash score, Constant score, and VAS were, respectively, 1.7 ± 4 (range, 0–11), 94.7 ± 7.3 (range, 82–100) and 0.5 ± 1.4 (range, 0–2). 35 patients (90%) were able to return to work, including physical labor-intensive jobs and sports. Three patients experienced reduced loss after six weeks, necessitating surgical stabilisation. In 90% of patients with acute acromioclavicular joint dislocation, they came to the conclusion that utilising a double button device produced an acceptable functional result linked with excellent acromioclavicular ligament repair and precise acromioclavicular joint congruency.[53]

A study on the Double-button Fixation System for Management of Acute Acromioclavicular Joint Dislocation was conducted by Ali Torkaman et al. in 2015. The double-button fixation system is a suitable technique for the management of acute acromioclavicular joint dislocation because it causes minimal damage to the soft tissues surrounding the coracoclavicular ligaments and shows significant differences between pre-operation VAS, constant shoulder scores, and post-operation measurements.[54]

Deepak Chaudhary et al. (2015) studied the use of the TightRope device for minimally invasive fixation of acute acromioclavicular joint dislocation. With one failure excluded, the average duration to resume employment was 4 (with a range of 1.5–12) months. The average Constant score following surgery was 86.4. (Range, 63–96). From 21.5±5.2 mm preoperatively to 9.8±3.5 mm at 6 months and to 10±3.2 mm at one year, the CC distance reduced. No overcorrection occurred. Except for one patient who experienced a TightRope suture rupture at six months, all patients had favourable outcomes. After 3 to 6 months, two patients had partial loss of reduction (2 mm) as a result of osteolysis at the location of the clavicular button.[55]

In 2016, James Brock et al; in their study on A Radiological and Clinical Evaluation of Acromioclavicular Joint Reconstruction Using Dog Bone Double Endobutton Technique. Radiologically, the mean post-operative CCD was 13.1, and the mean CCD decrease was 7.1 mm (n=26) (Normal range 11-13 mm) In terms of clinical data, the average post-operative ASES was 89.4 (n=22) (Best score 100). Between pre- and post-operative DASH scores, there was a reported mean drop of 50.5, with a mean post-operative score of 12.5 (n=18) (Best score 0). There were two infections and one dislocation (caused by a fall in the post-operative period). They came to the conclusion that restoring the AC joint's natural architecture and biomechanics would stop aberrant loads and lessen joint deterioration. Using Arthrex Dog Bone Buttons for AC repair The fibertape construction method is secure, permits the repair of the joint's anatomic structure, and exhibits early signs of a decrease in discomfort and improvement in function.[56]

D.Lu et al; in 2016, in their study on A comparison of double Endobutton and triple Endobutton techniques for acute acromioclavicular joint dislocation, concluded that Triple Endobutton technique did not show significant clinical advantages over double Endobutton technique.[57]

In their study entitled "Surgical treatment of acute acromioclavicular joint dislocations: hook plate vs minimally invasive repair," S. Metzlaff et al. published in 2016. The mean CMS, Taft score, and ACJI did not significantly differ between the two groups. The coracoclavicular distance did not significantly change, according to the radiological analysis. A minor decrease of reduction was seen in both groups. Eight patients in the hook plate group and eleven patients receiving the minimally invasive AC joint repair had periarticular ossification, but this had no bearing on the result. The median time between hook plate removals was 11.9 weeks (range 10–13). They came to the conclusion that hook plate fixation and minimally invasive AC joint repair can both produce good clinical outcomes. The hook plate group, however, requires a second procedure to remove the plates.[58]

S.-P. Issa et al. (2017) studied the minimally invasive reduction of acute acromioclavicular joint dislocation in 25 patients using a double-button device. They came to the conclusion that in 76% of patients, double-button treatment of high-grade acromioclavicular joint dislocation appeared to be a satisfactory long-term solution.[2]

Stein et al. conducted a prospective comparison of the double button procedure and the clavicular hook plate in 2018. The double double-button suture technique greatly outperformed the clavicular hook plate approach, according to the prospective investigation, in all clinical ratings. After surgery, all patients' ratings were considerably higher than they were before (all $P < .05$). The double button surgery had a considerable positive impact on these patients' clinical evaluations, according to the subanalysis of the severe injuries (Rockwood IV/V).[6]

Hasan Taleb et al. conducted a study in 2019 titled "Comparison of Short-Term Clinical Outcomes of Hook Plate (HP) and Continuous Loop Double Endobutton (CLDE) Fixations in Acute Acromioclavicular Joint Dislocation" and came to the conclusion that the CLDE fixation had superior clinical results to the HP fixation. With an application that was technically simple, the HP kept the CC distance better than CLDE. For the excision of the subacromial erosion and osteoarthritis of the ACJ, which might be viewed as severe issues, the HP necessitates a second operation.[59]

In their study on Truly anatomic coracoclavicular ligament reconstruction with two EndoButton devices for acute Rockwood type V acromioclavicular joint dislocations published in 2022, Cheng Xue MD et al. looked at 5-year results on 25 patients, 23 of whom (92%) remained satisfied or extremely satisfied with the treatment's outcomes. The visual analog scale score and Constant score improved significantly when compared with the baseline scores (0 ± 0 and 96 ± 3, respectively, at 5-year follow-up vs. 5 ± 1 and 45 ± 6, respectively, postoperatively) and remained essentially unchanged when compared with the 2-year follow-up data (0 ± 0 and 96 ± 3, respectively, at 5-year follow-up vs. 0 ± 1 and 95 ± 3, respectively, at 2-year follow-up). Three patients (12%) had loss of reduction on the 5-year radiographs, while five patients (20%) had calcifications identified. They came to the conclusion that at five years after surgery, truly anatomic coracoclavicular ligament repair with two EndoButton devices produces good functional results.[60]

MATERIALS AND METHODS

1. SOURCE OF DATA:

- Patients admitted in Department of Orthopaedics in BLDE (DEEMED TO BE UNIVERSITY) Shri B. M. Patil's Medical College, Hospital and Research Centre, with the diagnosis of type IV and type V acute acromioclavicular joint dislocation.
- Informed consent for the participation in study and surgical details are taken.
- The period of study will be from 1st January 2021 to 31st May 2022.

2. METHOD OF COLLECTION OF DATA:

- Patients admitted in Department of Orthopedics in BLDE (DEEMED TO BE UNIVERSITY) Shri B. M. Patil Medical College, Hospital and Research Centre, with the diagnosis of Rockwood type IV and type V acute acromioclavicular joint dislocation.
- History taking.
- Clinical examination.
- Radiological examination – X-Ray Shoulder Anteroposterior, Axial and Zanca views.

INCLUSION CRITERIA

1. Patient aged 18 years and above.
2. Acute acromioclavicular joint dislocation Rockwood classification type IV and type V.
3. Patients who gave written informed consent.

EXCLUSION CRITERIA

1. Patient aged less than 18 years.
2. Patients with polytrauma.
3. Associated neurovascular injury.
4. Associated clavicle or proximal humerus fractures.
5. Patients medically unfit for surgery.

SAMPLE SIZE CALCULATION:

With anticipated Incidence of acute acromioclavicular joint dislocations to be 9%[1-3], the study would require a sample size of **32** patients with a 95**%** level of confidence and 10% absolute precision**.**

Formula used

- $\mathbf{n = \frac{z^2\ p*q}{d^2}}$

Where Z= Z statistic at α level of significance

d^2= Absolute error

P= Proportion rate

q= 100-p

STATISTICAL ANALYSIS:

- The data obtained will be entered in a Microsoft Excel sheet, and statistical analysis will be performed using a statistical package for the social sciences (Version 20).
- Results will be presented as Mean (Median) ±SD, counts and percentages, and diagrams.

TYPE OF STUDY: Prospective study.

INVESTIGATIONS:

Investigations or interventions required in this study are routine standardized procedures. There is no animal experiment involved in this study.

- X-ray of affected shoulder AnteroPosterior, Axial views, and Zanca view.
- Computed-tomography scan if necessary.
- Complete blood count.
- Bleeding time, Clotting time.
- Random blood sugar, Blood urea and Serum creatinine.
- HIV, HbsAg & HCV
- Blood grouping and Rh- typing.
- ECG.
- Chest X-ray- Posterio-anterior view.
- Other specific investigations whichever needed.

TREATMENT:

- Preliminary treatment on admission - special shoulder immobilizer.
- Analgesics.
- Anaesthesia.
- Final inspection of the reduction of the acromioclavicular joint under Image intensifier guidance.

PROCEDURE: Open reduction and repair of Acromioclavicular joint dislocation using Double Button fixation and fiber tape.

POSTOPERATIVE MANAGEMENT:

- Intravenous antibiotics will be continued for the first three days and then shifted to oral.
- Check x-ray in the postoperative period.
- Dressing on the 2nd day and on suture removal day.
- Post-op rehabilitation protocol as per guidelines.
- Functional outcome following using Double button technique will be evaluated based on DASH score and constant score.
- Complications:
    - Infection
    - Wound breakdown
    - Loss of fixation/reduction
    - Implant failure
    - Implant irritation
    - Need for re-surgery

FOLLOW-UP:

1. Clinical follow-up will be done at 6wks, 3months, 6months intervals and will be assessed with reference to DASH and constant scores.
2. Radiological follow-up at 6weeks, 3months, 6months intervals with X-ray Shoulder - AnteroPosterior, Axial, and Zanca views.

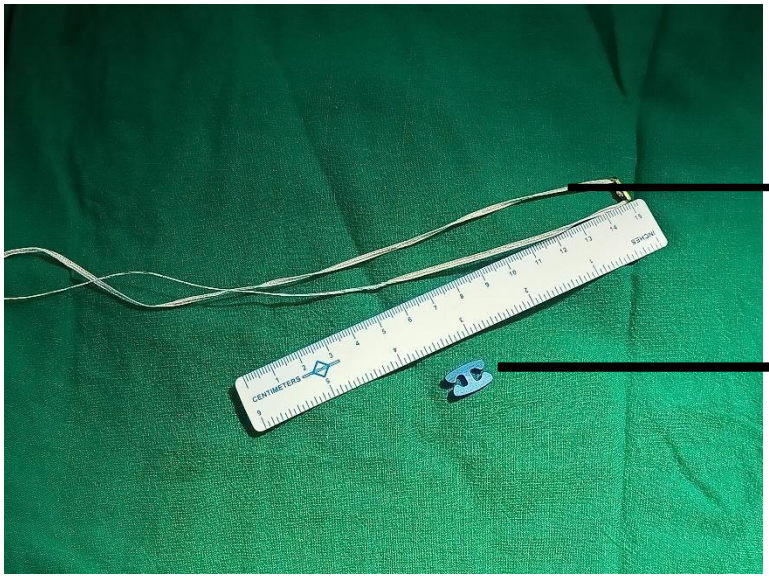
PROBABLE OUTCOME:

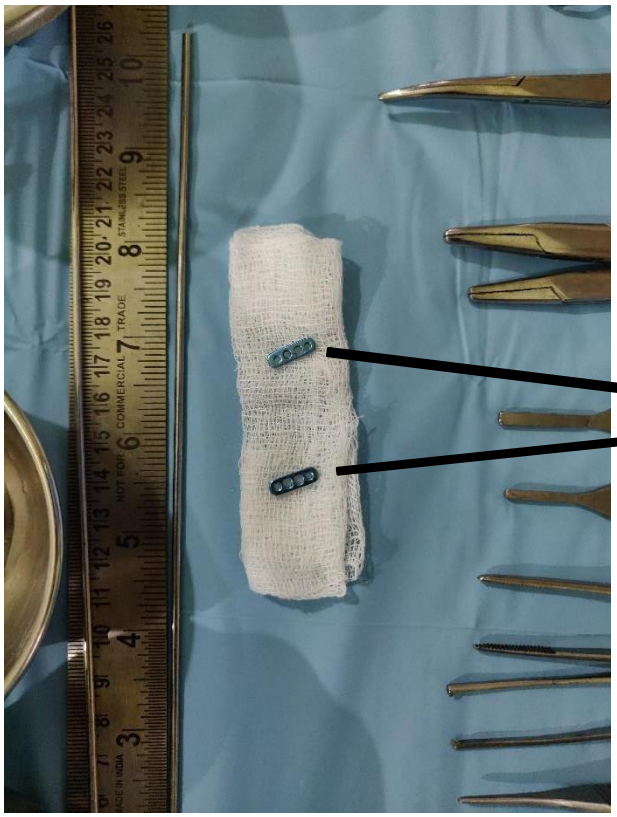
- To postulate that double-button fixation with fiber tape will reproduce near normal anatomical stabilization of acromioclavicular joint with predictable coracoclavicular ligament healing.

The following criterias were used to evaluate the cases:

- AGE AND GENDER DISTRIBUTION
- LATERALITY OF DISLOCATION
- MECHANISM OF DISLOCATION
- GRADING OF DISLOCATION BASED ON ROCKWOOD TYPES
- TIME TAKEN TO SURGERY FROM THE DATE OF INJURY
- ASSOCIATED INJURIES
- POST-OPERATIVE STAY
- RADIOGRAPHIC EVALUATION AT 6 WEEKS, 3 MONTHS, 6 MONTHS
- RANGE OF MOVEMENTS AT SHOULDER JOINT
- FUNCTIONAL OUTCOMES USING DASH AND CONSTANT SCORES
- POSTOPERATIVE COMPLICATIONS

Figure 19: IMPLANTS



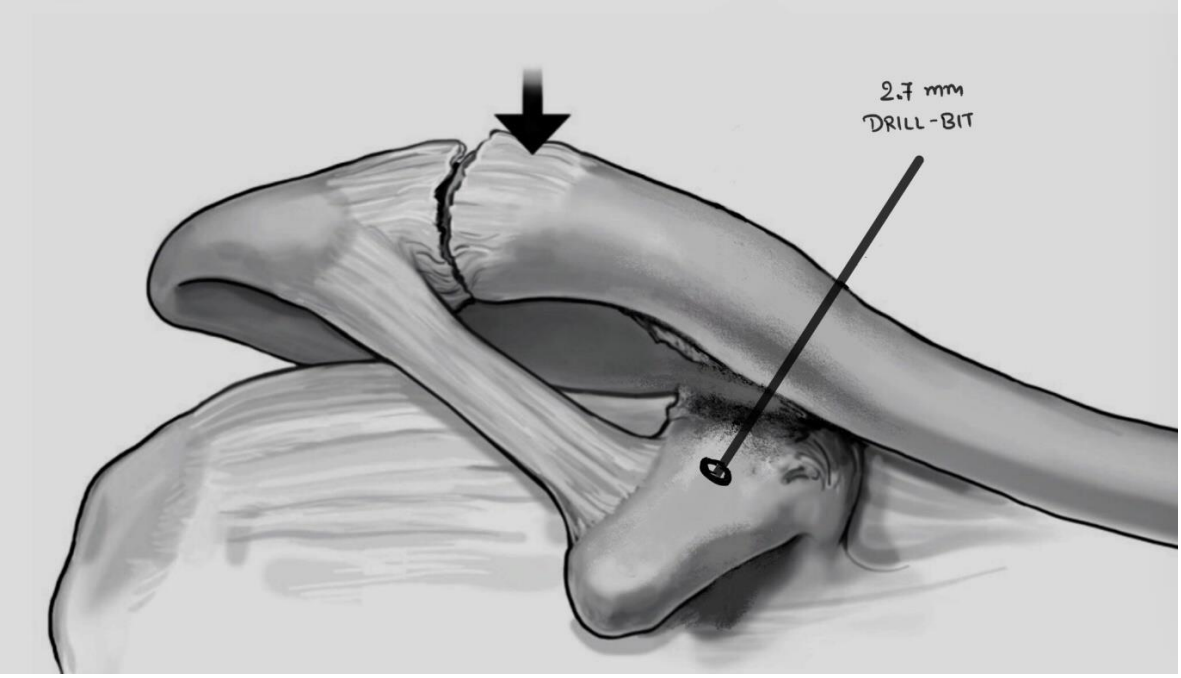


SURGICAL PROCEDURE

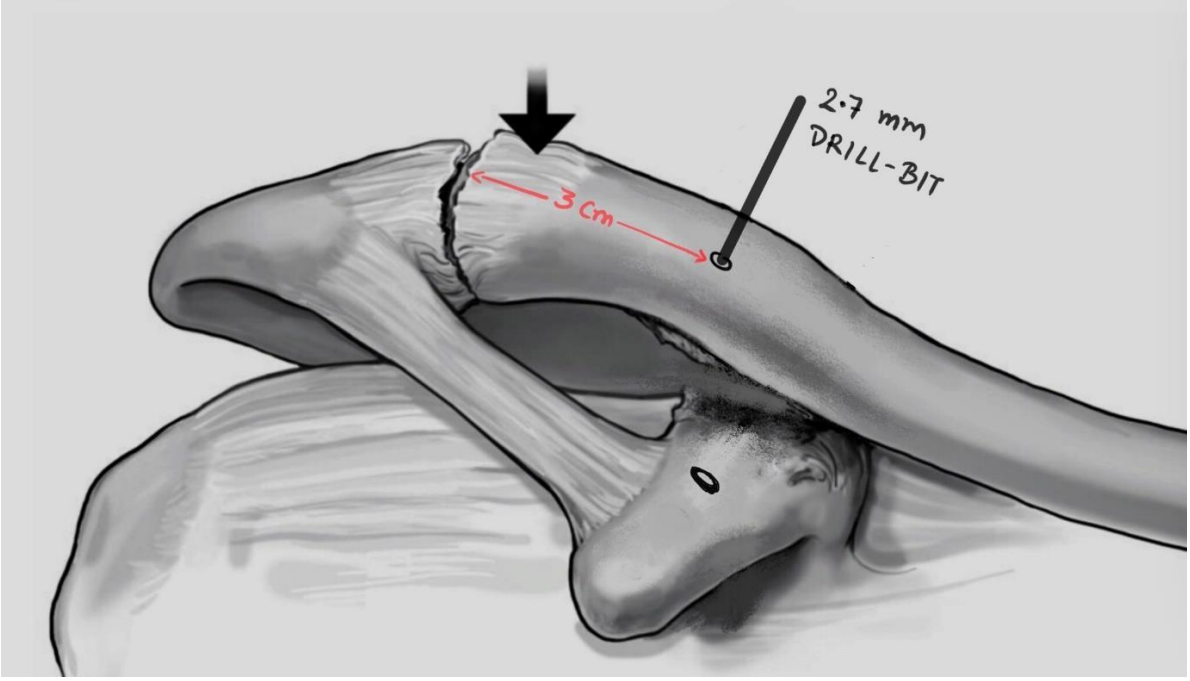
Patient is put in beach chair position with the hip in slight flexion. Sandbag is placed between scapulas to elevate shoulder joint. Under strict sterile precautions parts scrubbed, painted and draped. An incision is made 2 inches above the base of the coracoid tip and extends to the anterior edge of the distal clavicle (fig.22 a). Both the medial and lateral flaps are elevated. It is split along the deltoid fibers, and the exposure of coracoid from apex till its base is of prime importance. The medial and lateral borders at the coracoid base should be clearly seen (fig.22 b). The AC joint's articular disc was cleaned out to enable effective reduction. The base of coracoid was drilled using 2.7mm drill bit directed laterally and anteriorly (fig.22 c).

The clavicle was prepared with two tunnels 1.5cms apart, the medial most being atleast 4cms from the lateral end of clavicle at the midpoint between anterior and posterior borders (fig.22 d). Sutures were shuttled from the base of coracoid and endobutton was flipped on the under surface of coracoid process (fig.22 e). The two ends of fiber tape attached to endobutton were shuttled out of the clavicular holes, one in each. The two ends of the tape are now tied over the clavicle using an AC button (fig.22 f). During the tying of fiber tape, manual pressure on the distal end of clavicle was applied making sure of the reduction and also checking the decrease in space between surface of clavicle and base of coracoid. The reduction is confirmed on image intensifier (fig.22 g). About 5-6 knots were applied before cutting fiber tape. Incision is closed in layers over a drain (fig.22 h). Post-operative immobilization was done with arm sling pouch.

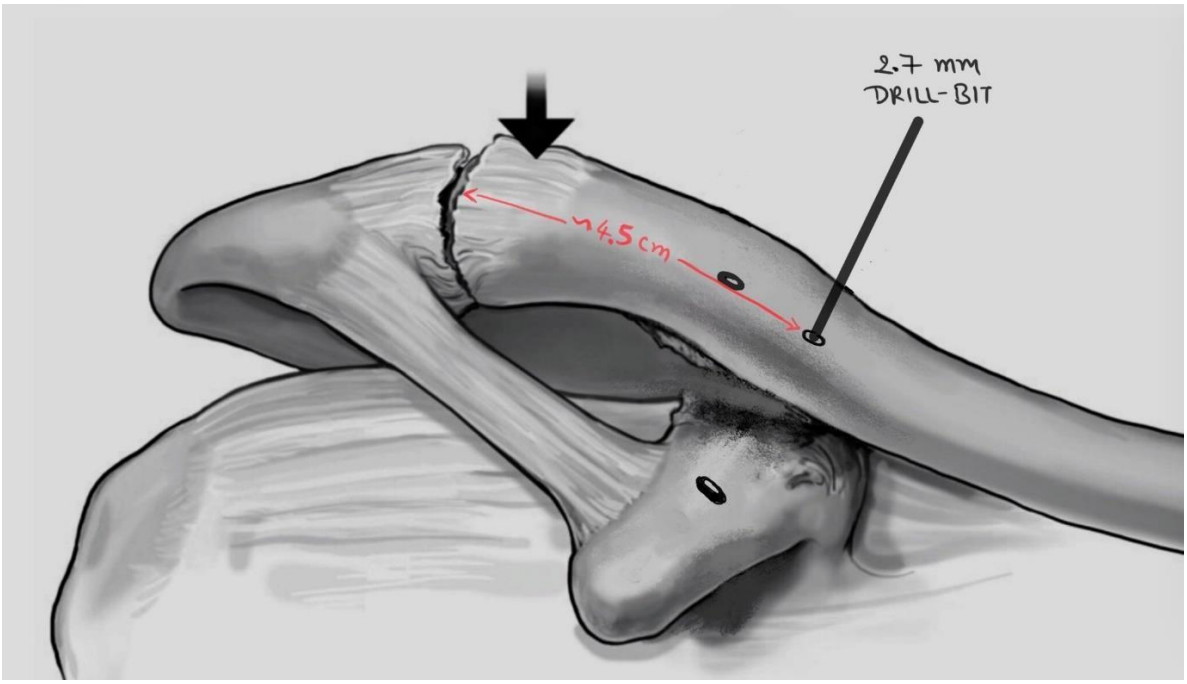
Figure 20: SURGICAL TECHNIQUE



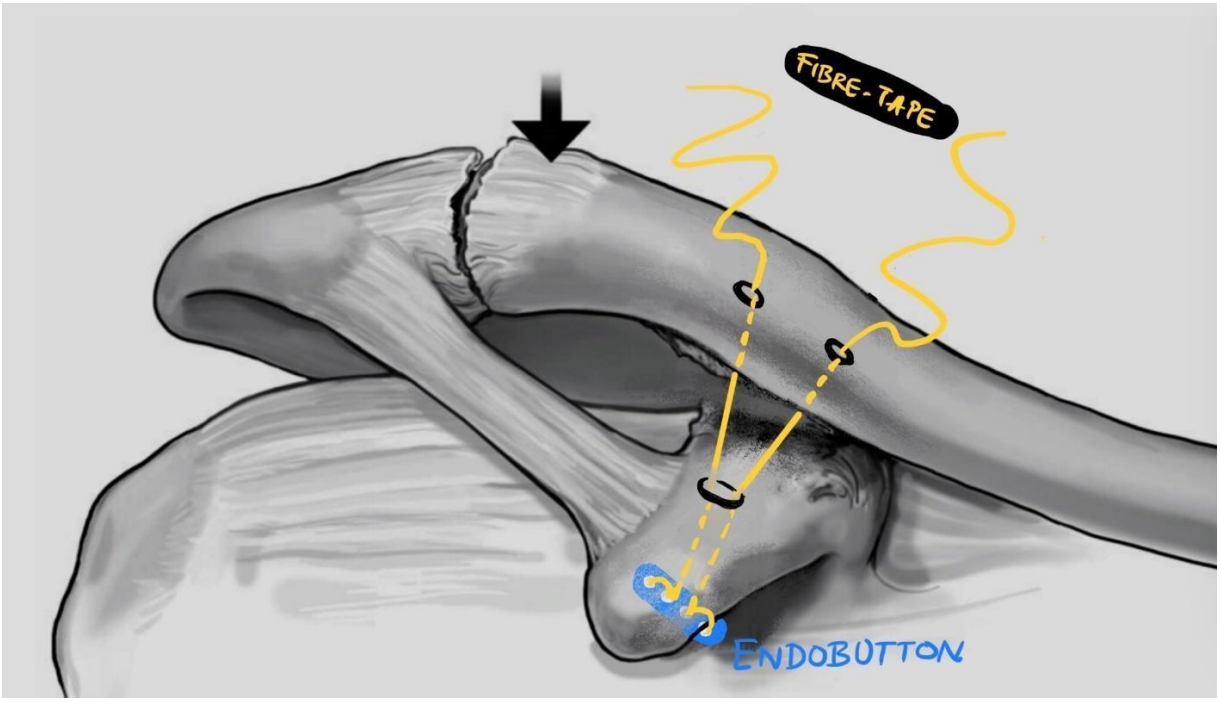
A. Drilling base of coracoid process using 2.7mm drill bit directed laterally and anteriorly.



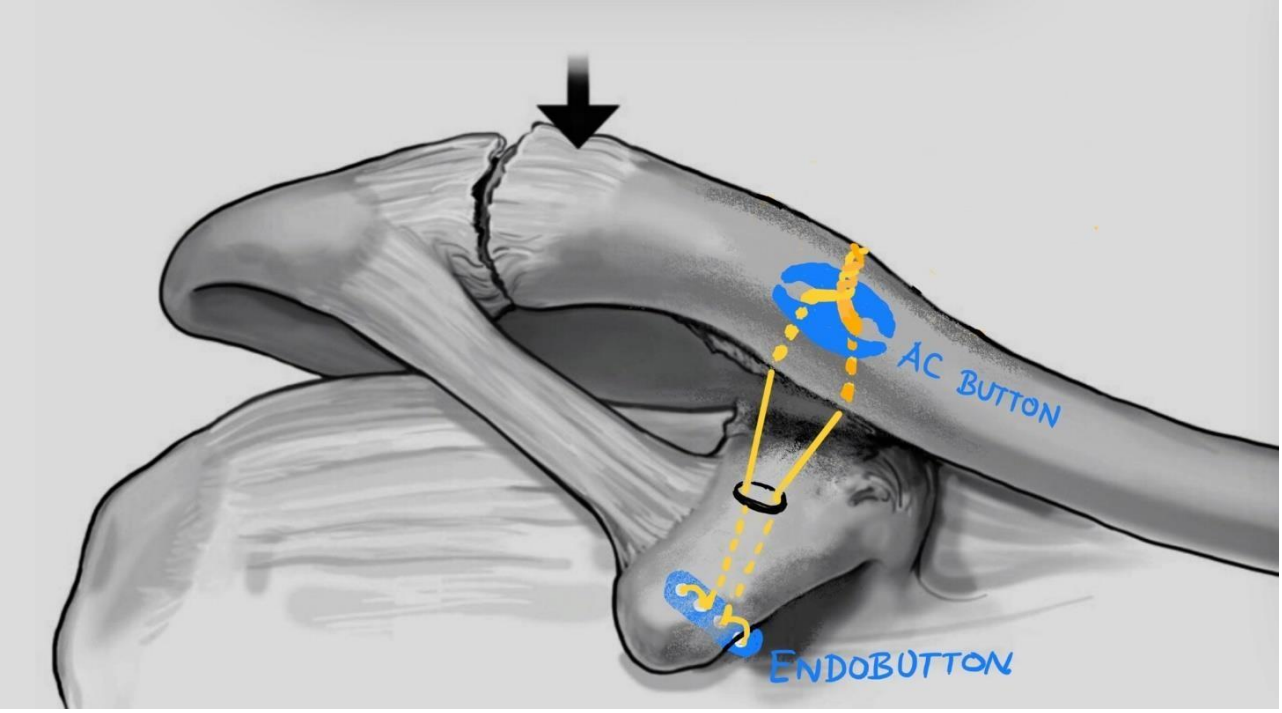
B. Preparing lateral tunnel over clavicle 3cms from lateral end of clavicle midway between anterior and posterior borders using 2.7mm drill bit.



C. Preparing 2nd tunnel on clavicle 1.5cms from lateral tunnel using 2.7mm drill bit.



D. Flipping of endobutton on the under surface of coracoid process & shuttling of two ends of fiber tape attached to endobutton out of the clavicular holes, one in each.



E. Tying of two ends of the tape over the clavicle using an AC button while applying manual pressure on the distal end of clavicle and making sure of the reduction.

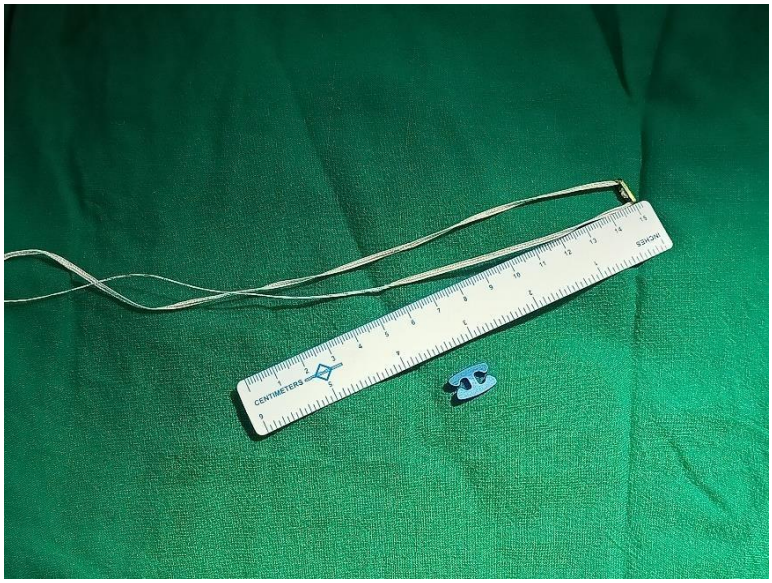
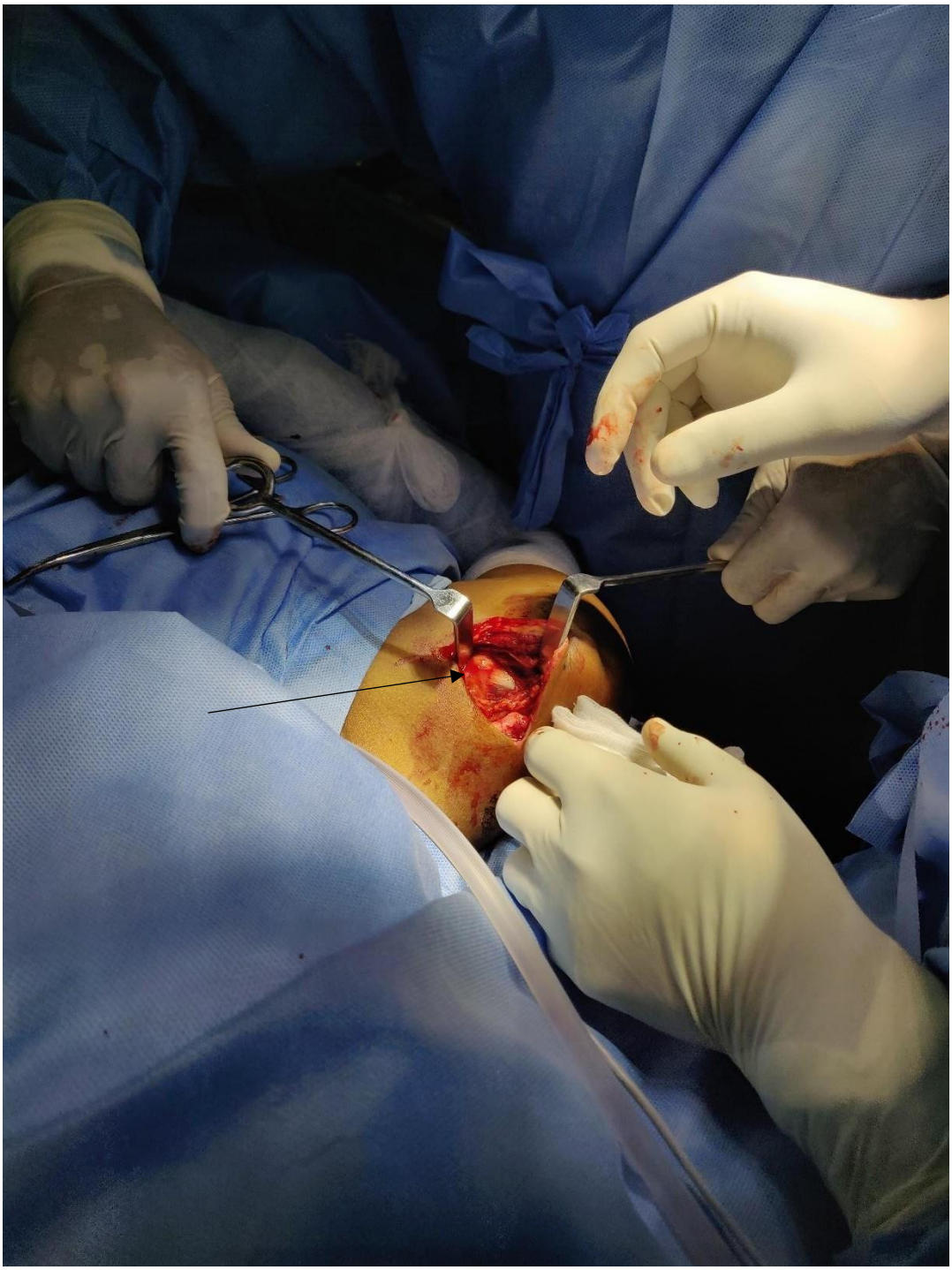


Figure 21: OT Trolley with instruments & implants pics

Figure 22: INTRA-OPERATIVE PICTURES

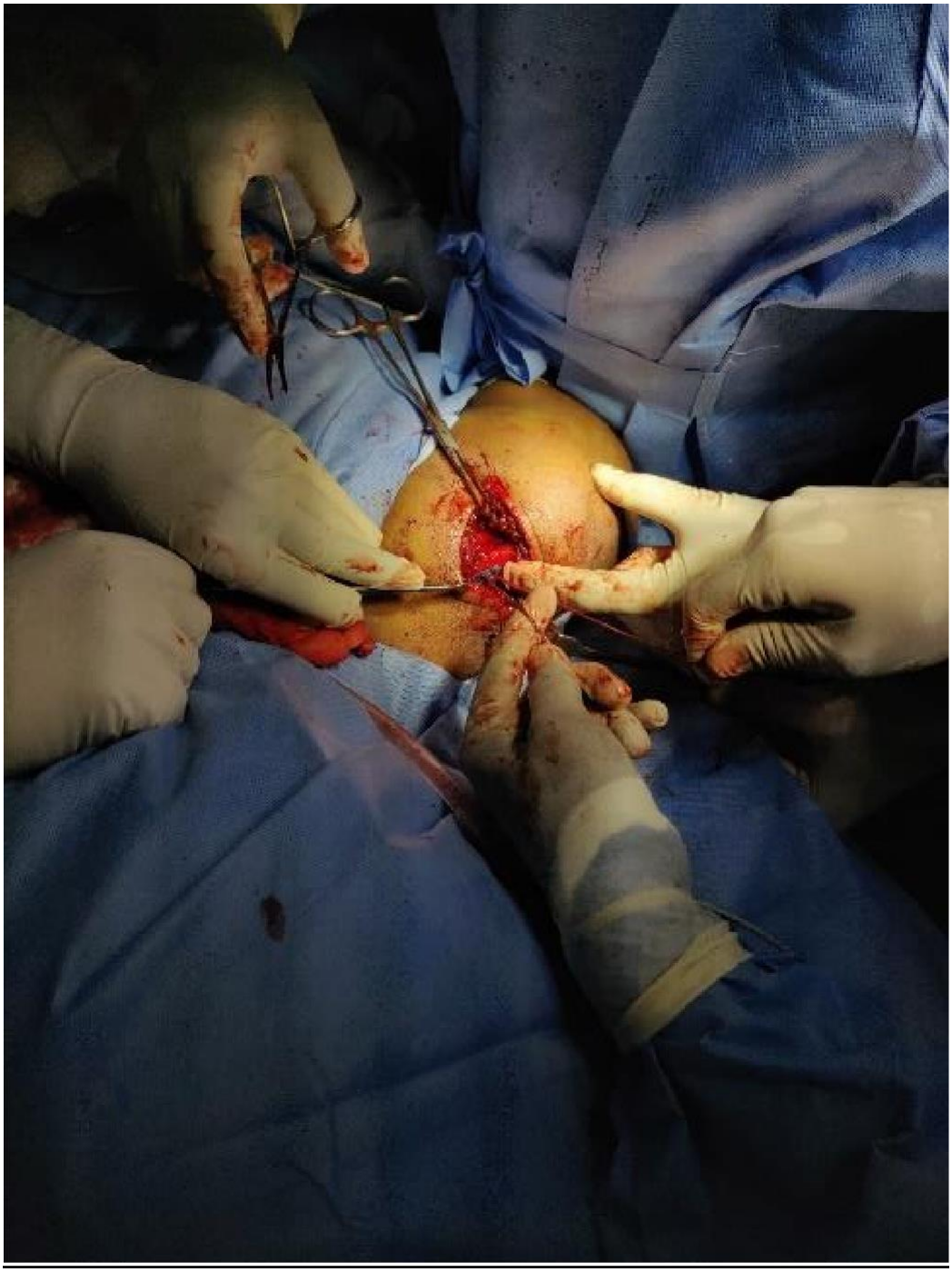
(a) Draping, surface marking of anatomy and skin incision.



(b) Exposure of base of coracoid (arrow mark).

(c) Drilling base of coracoid using 2.7mm drill bit

(d) Making clavicle tunnels



(e) Flipping of endobutton under the base of coracoid and shuttling of ends of fiber tape out of claviclar holes

(f) Tying of ends of fiber tape over clavicle using AC button while simultaneously applying manual pressure over lateral end of clavicle to maintain reduction of AC joint.

(g) Confirming reduction on image intensifier.

(h) Wound closure

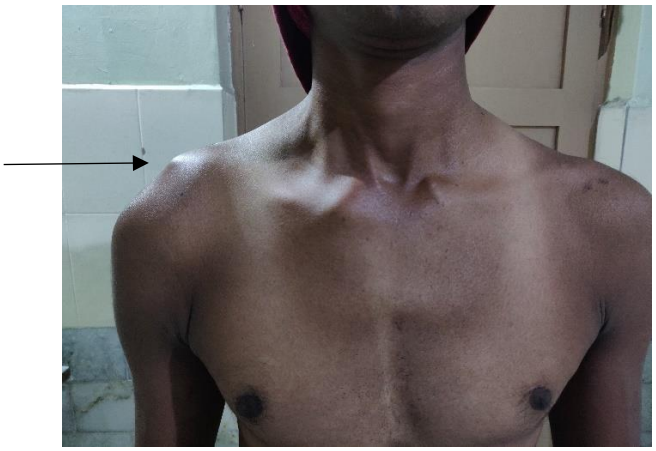
POSTOPERATIVE PROTOCOL

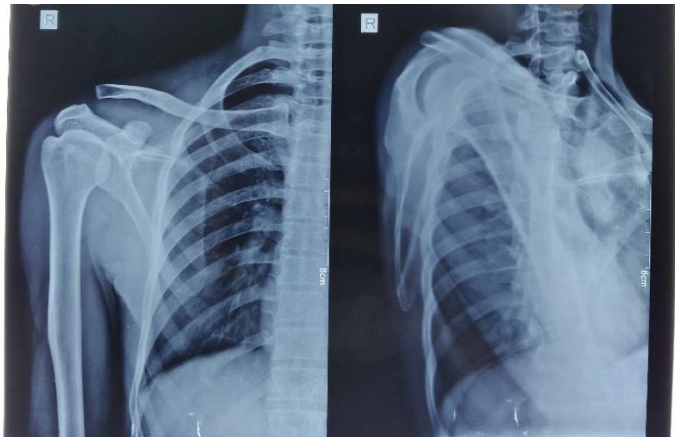
Shoulder pendular exercises are started from second postop day, and assisted passive mobilization was added when the patient was able to tolerate it. After three weeks, full range of motion was introduced, and within three weeks, active movements were commenced.

We used the DASH questionnaire and Constant Murley score. These 2 scoring systems reflect subjective and objective perspectives of shoulder function.

The DASH questionnaire score has a range of 0-100, with zero being the best score and great outcomes. A score of 100 denotes a poor performance. A top score of 100 denotes the best and most extraordinary outcomes for the constant score, while a score of 0 denotes the worst and least impressive outcomes. Forms were completed at each consultation, and we checked for any indications of failure of implant, pain, irritability, impingement, or infection. X-rays were taken before surgery, just after surgery, at 6 weeks, at 3 months and after 6 months. The positioning of the endobutton, the reduction of the AC joint, and the calcification of the CC were all evaluated repeatedly.

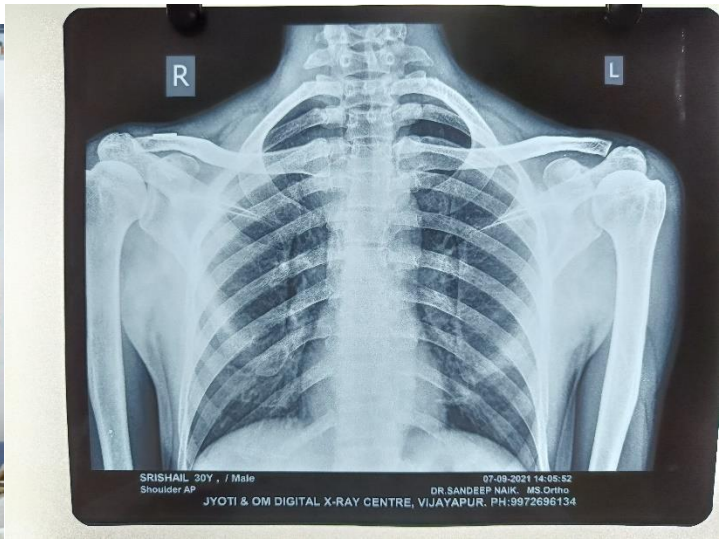
Figure 23: CASE - 1





(A) Clinical pic showing tenting of skin on right side (arrow mark) and restricted ROM. Radiograph showing right side Rockwood type 4 AC joint disruption.

(B) Intra-op reduction confirmed on image intensifier.



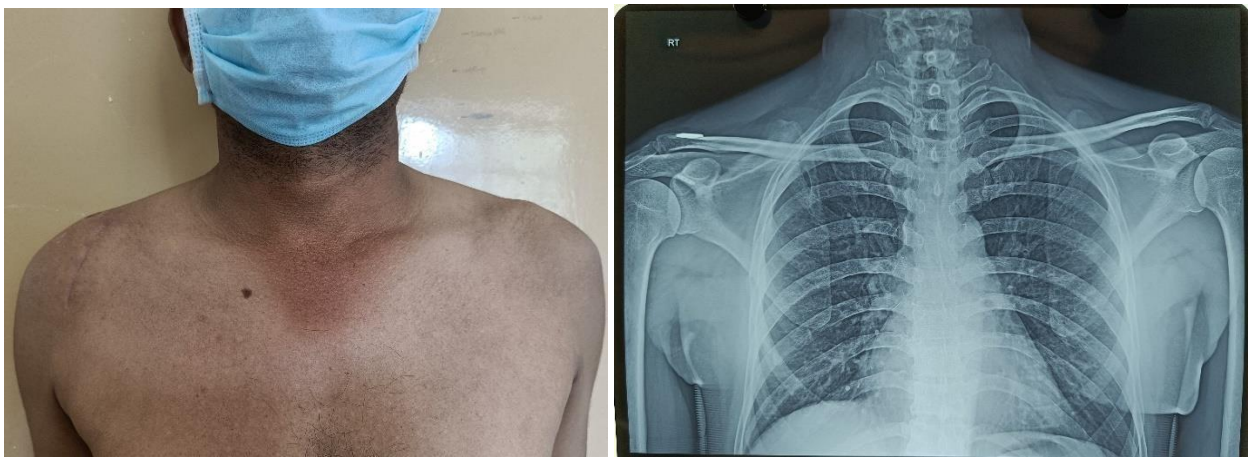
(C) Post-op picture showing scar mark and absence of pre-op tenting of skin and check x-ray confirming anatomical reduction of AC joint.

(D) Post-op clinical pictures showing complete ROM over right shoulder.

Figure 24: <u>CASE - 2</u>

(A) Clinical pic showing tenting of skin on right side (arrow mark) and restricted ROM. Radiograph showing right side Rockwood type 5 AC joint disruption.

(B) Intra-op reduction confirmed on image intensifier.



(C) Post-op picture showing scar mark and absence of pre-op tenting of skin and check x-ray confirming anatomical reduction of AC joint.

(D) Post-op clinical pictures showing complete ROM over right shoulder.

OBSERVATIONS/RESULTS

This study has a total of 36 patients who were admitted under the Orthopaedics department in Shri B M Patil Medical College Hospital and Research center, Vijayapura. The observations and findings obtained at the completion of this study are listed below.

TABLE 1: AGE WISE DISTRIBUTION

Age (Years)	No. of patients	Percentage
< 30	11	30.6
30 – 39	16	44.4
40 – 49	6	16.7
50+	3	8.3
Total	36	100.0

FIGURE 25: AGE WISE DISTRIBUTION

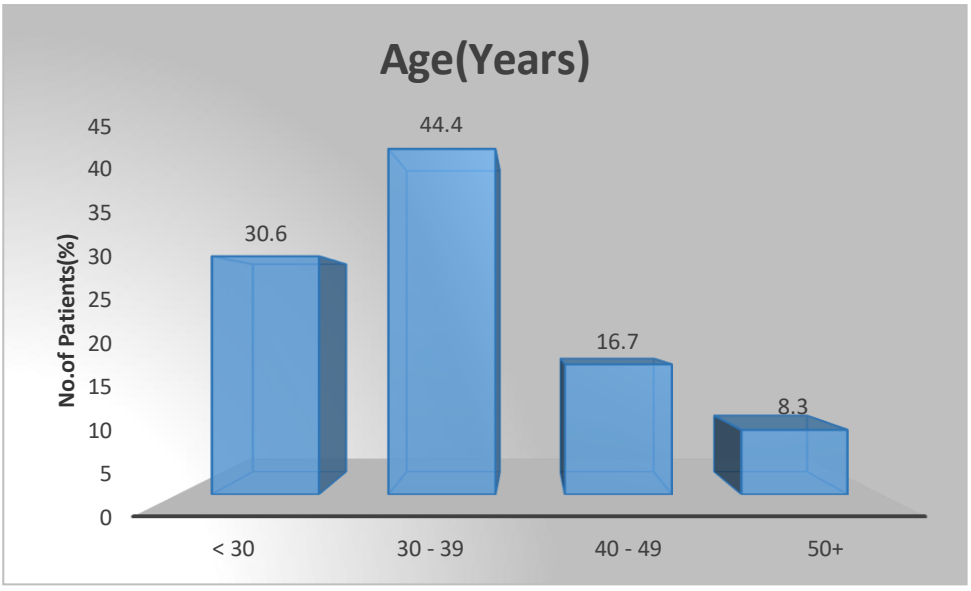


TABLE 2: SEX WISE DISTRIBUTION

Gender	No. of patients	Percentage
Female	3	8.3
Male	33	91.7
Total	36	100.0

FIGURE 26: SEX WISE DISTRIBUTION

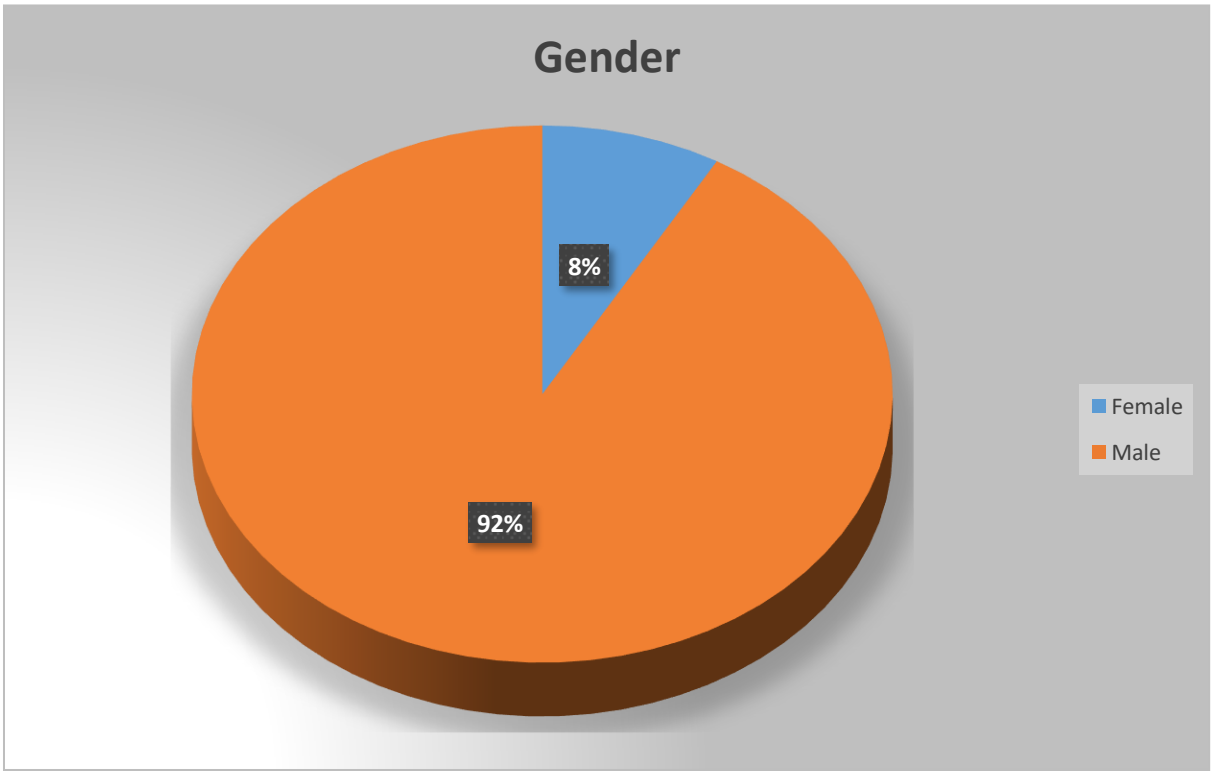


TABLE 3: DISTRUBUTION ACCORDING TO MODE OF INJURY

Mode of injury	No. of patients	Percentage
Fall From Height	2	5.6
RTA	30	83.3
Slip Injury	4	11.1
Total	36	100.0

FIGURE 27: DISTRUBUTION ACCORDING TO MODE OF INJURY

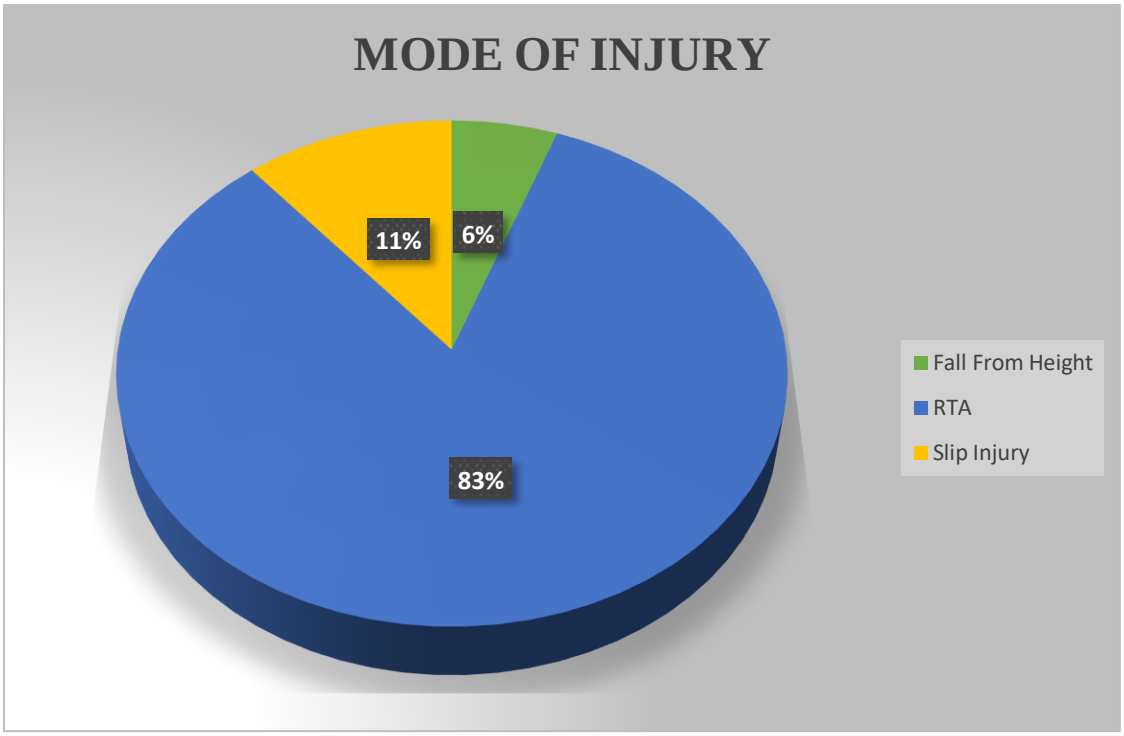


TABLE 4: DISTRUBUTION ACCORDING TO SIDE OF INJURY

Side of Injury	No. of patients	Percentage
Left	12	33.3
Right	24	66.7
Total	36	100.0

FIGURE 28: DISTRUBUTION ACCORDING TO SIDE OF INJURY

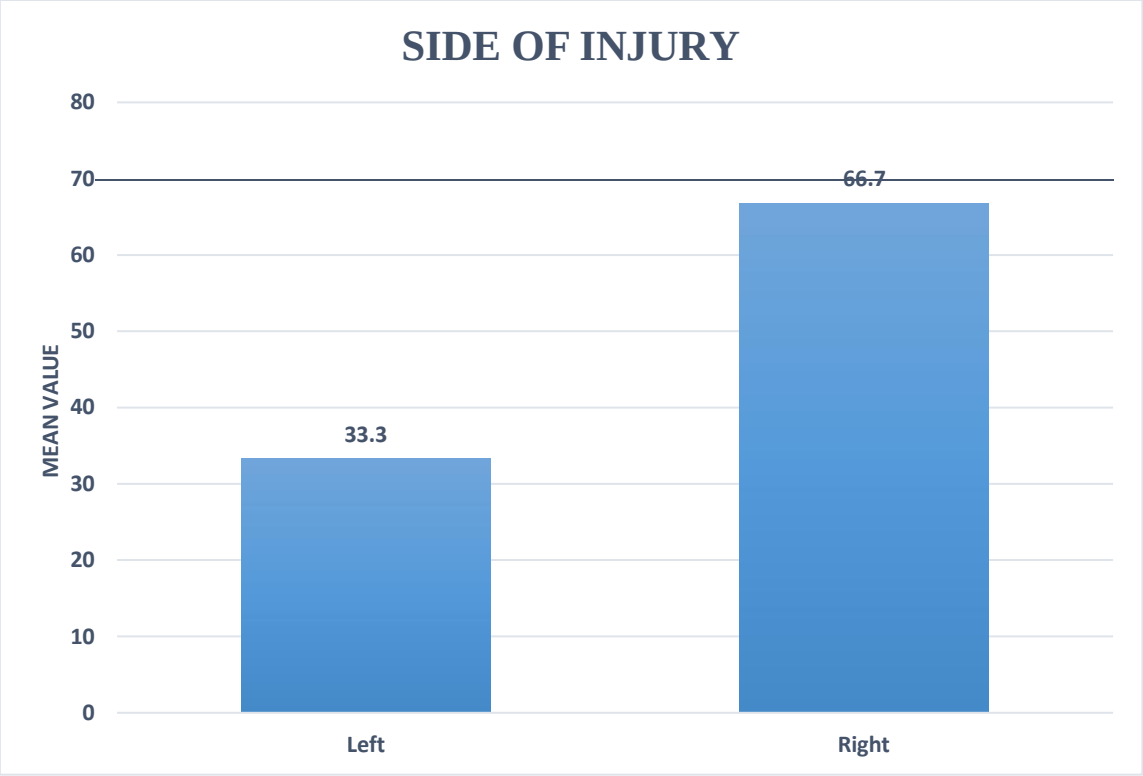


TABLE 5: DISTRUBUTION ACCORDING TO ROCKWOOD CLASSIFICATION

Rockwood Classification	No. of patients	Percentage
TYPE 4	11	30.6
TYPE 5	25	69.4
Total	36	100.0

FIGURE 29: DISTRUBUTION ACCORDING TO ROCKWOOD CLASSIFICATION

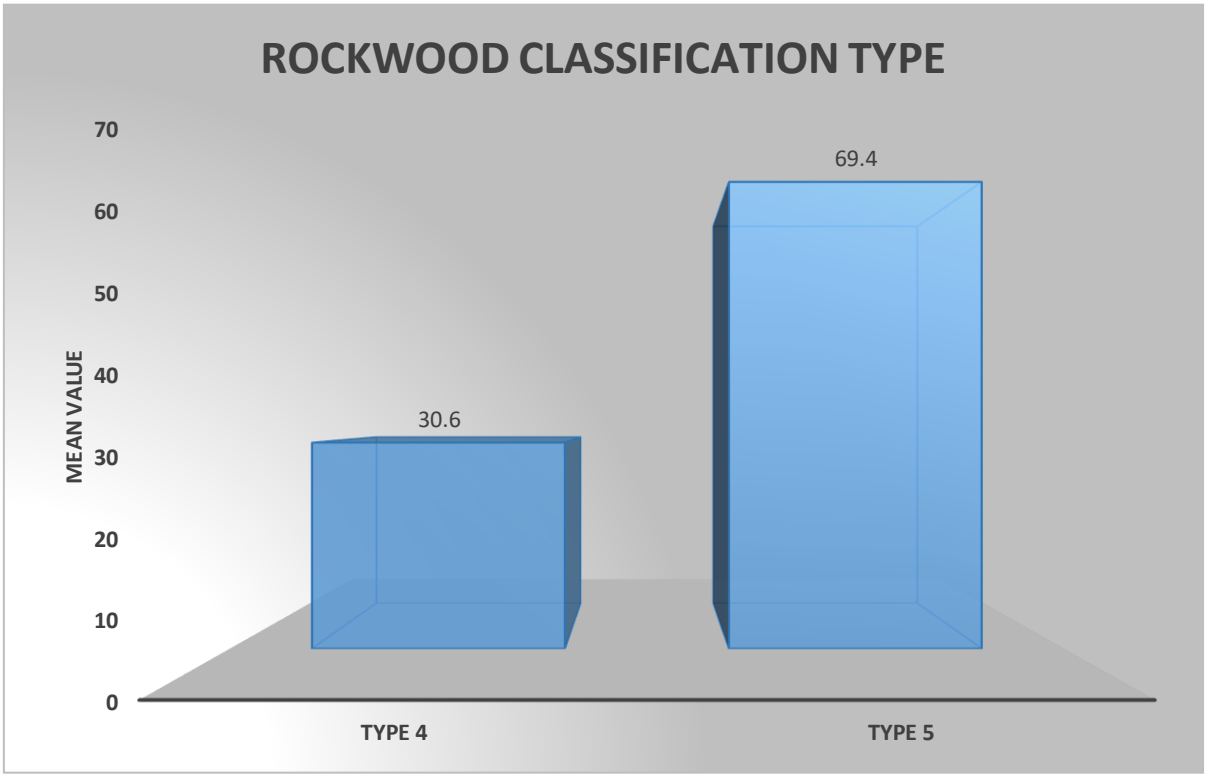


TABLE 6: ASSOCIATED INJURIES

Associated injuries	No. of patients	Percentage
Nil	32	88.9
Rib Fracture	3	8.3
Scapula Fracture	1	2.8
Total	36	100.0

FIGURE 30: ASSOCIATED INJURIES

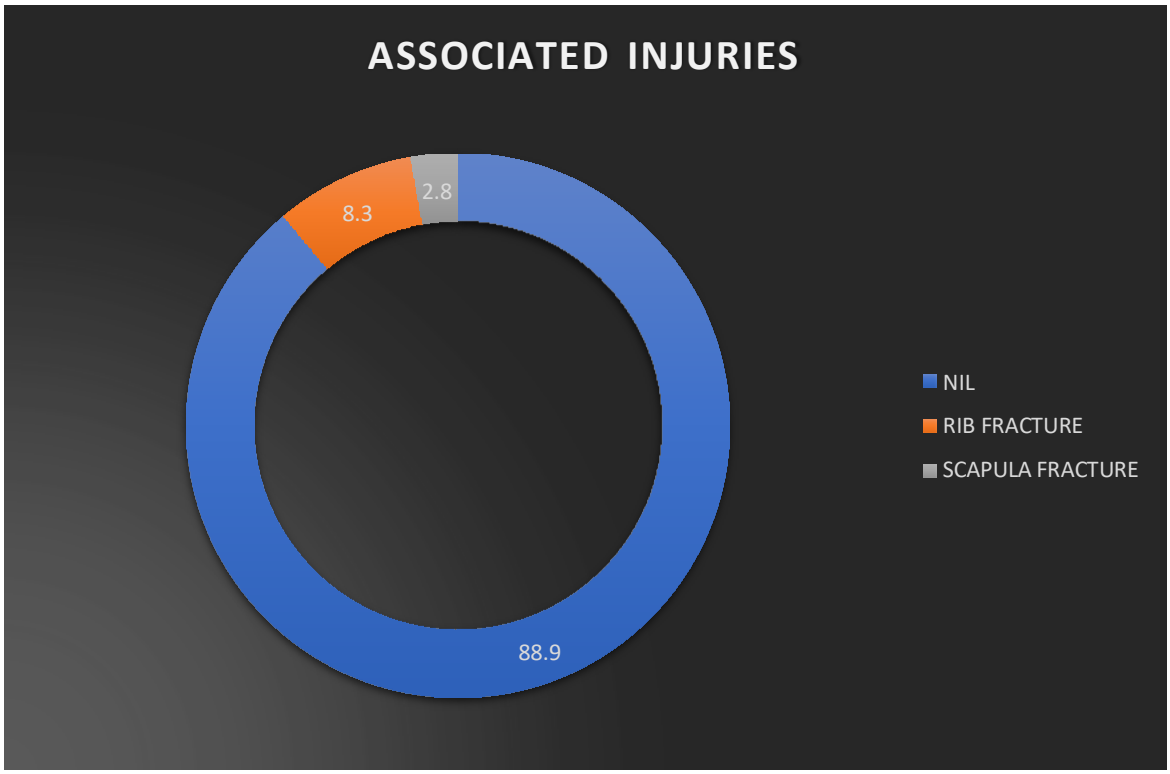


TABLE 7: TIME INTERVAL BETWEEN INJURY AND SURGERY

Time to surgery (Days)	No. of patients	Percentage
1	11	30.6
2	13	36.1
3	9	25.0
4	3	8.3
Total	36	100.0

TABLE 31: TIME INTERVAL BETWEEN INJURY AND SURGERY

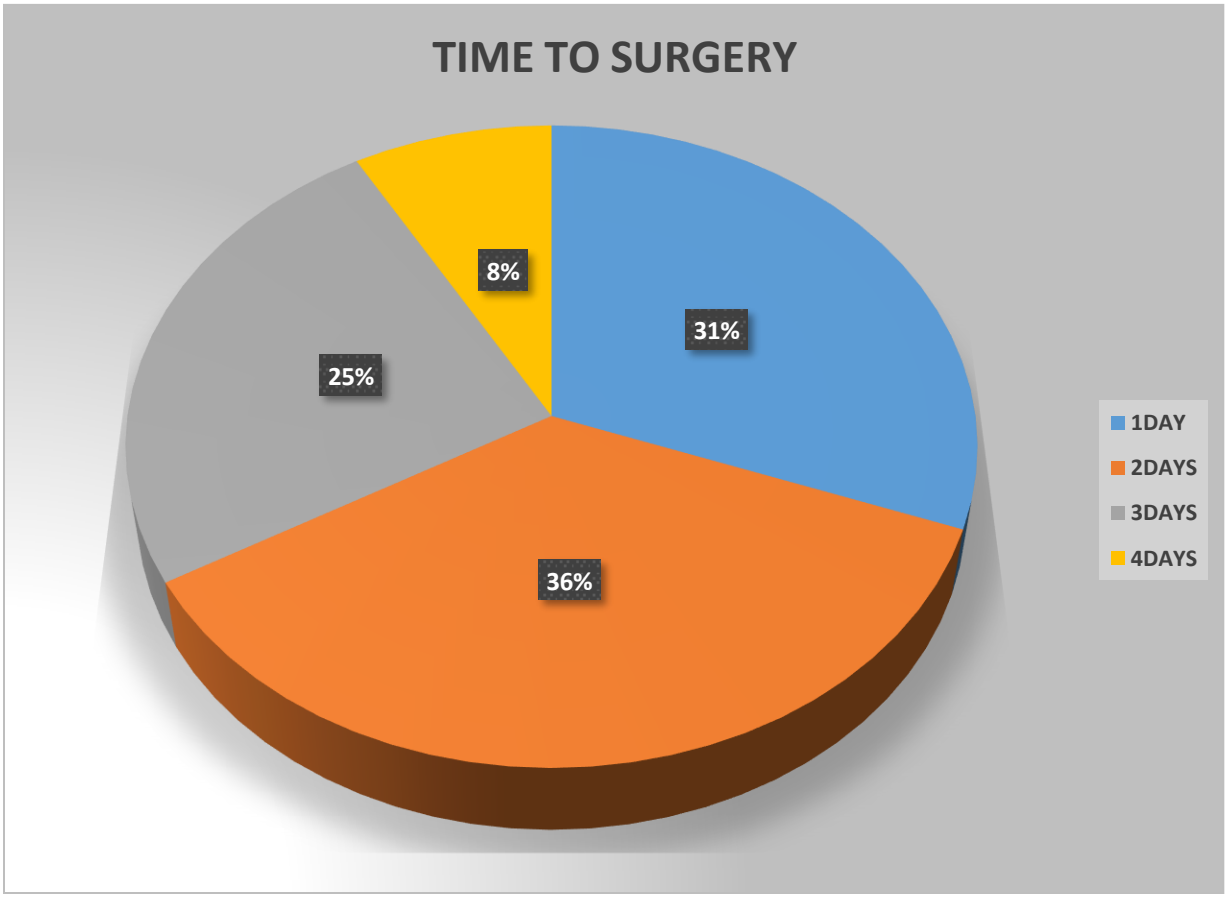
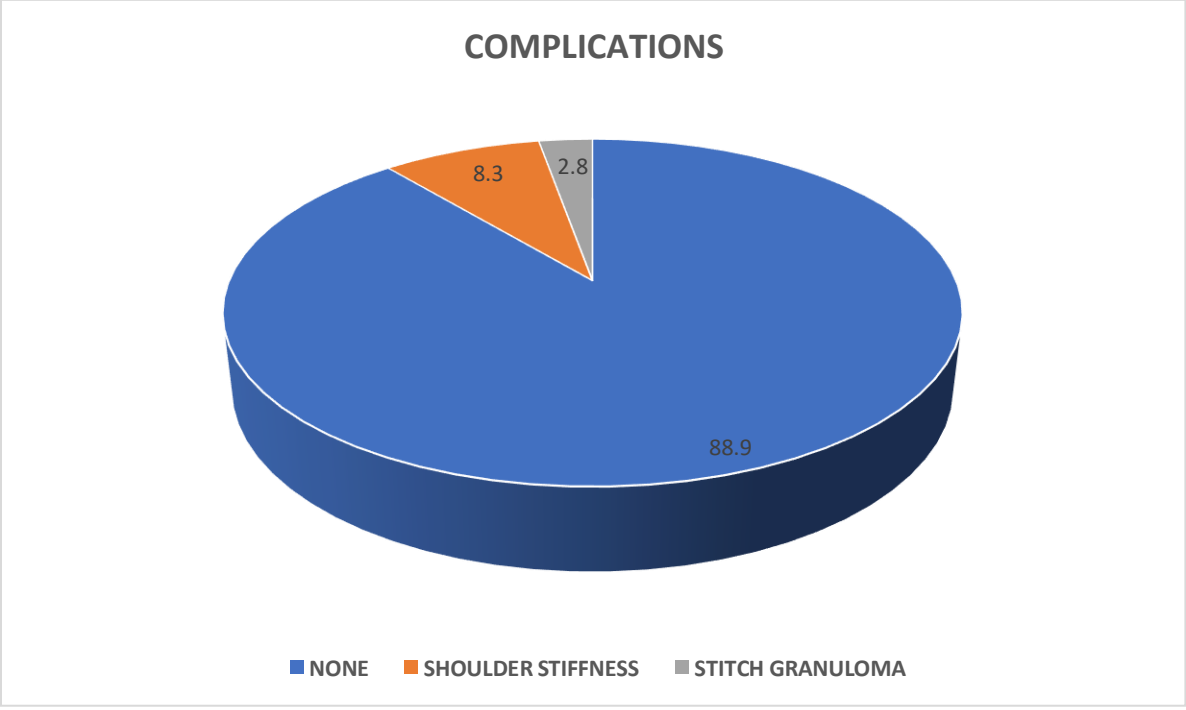


TABLE 8: COMPLICATIONS

Complications	No. of patients	Percentage
None	32	88.9
Shoulder Stiffness	3	8.3
Stitch Granuloma	1	2.8
Total	36	100.0

FIGURE 32: COMPLICATIONS



ASSESSEMENT OF FUCTIONAL OUTCOME

TABLE 9: COMPARISION OF DASH SCORE

DASH SCORE	Mean	Std. Deviation	Friedman Test	P Value
Pre-Op	48.97	4.808	108.000	0.0001
Post-Op 6 Weeks	37.83	3.723		
Post-Op 3 Months	18.81	2.816		
Post-Op 6 Months	5.33	2.165		
Statistically significant				

FIGURE 33: COMPARISION OF DASH SCORE

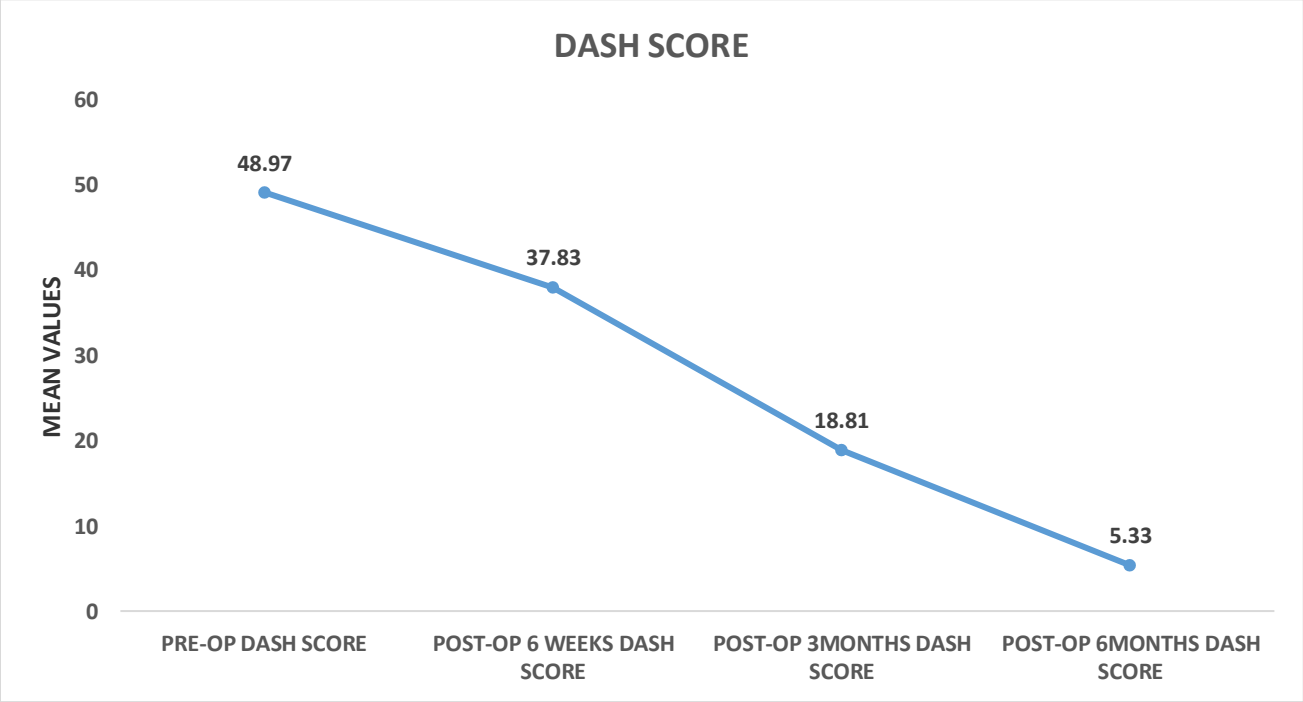


FIGURE 34: COMPARISION OF DASH SCORE

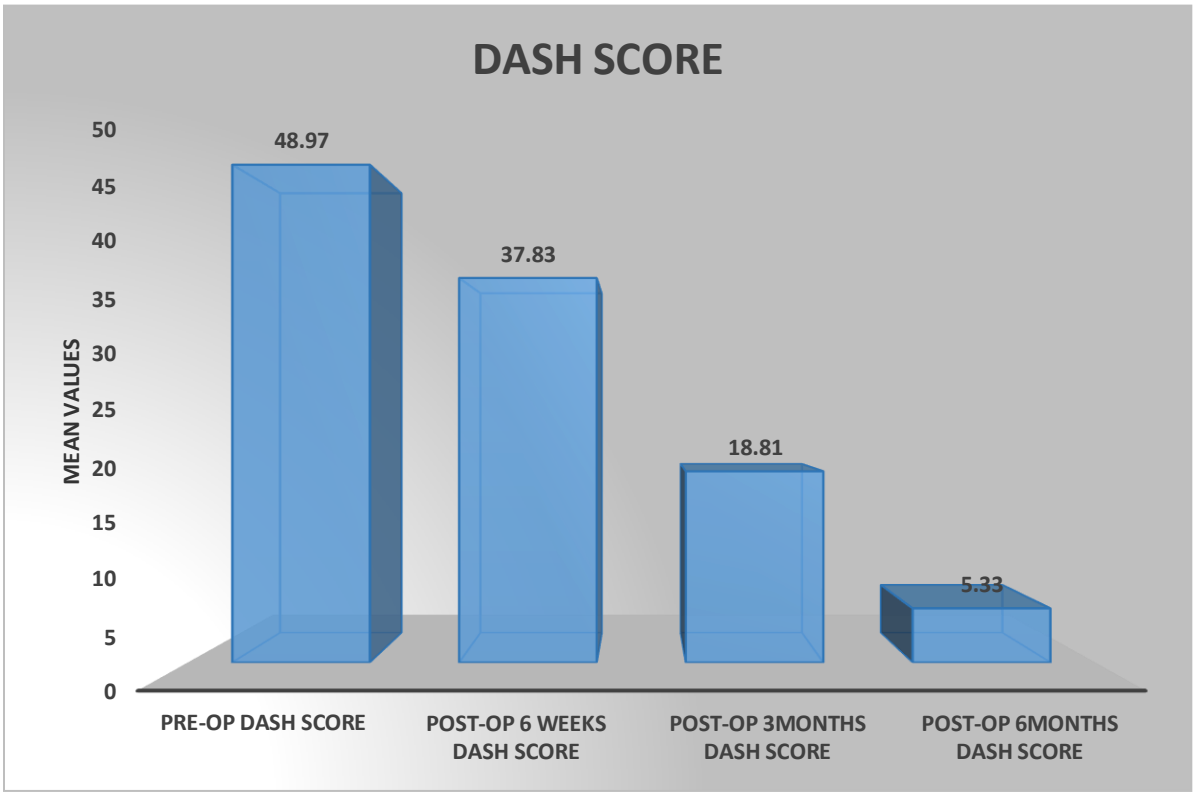


TABLE 10: COMPARISION OF CONSTANT SCORE

CONSTANT SCORE	Mean	Std. Deviation	Friedman Test	P Value
Pre-Op	33.67	4.276	108.000	0.0001
Post-Op 6 Weeks	53.72	3.997		
Post-Op 3 Months	75.19	3.740		
Post-Op 6 Months	95.11	2.327		
Statistically significant				

FIGURE 35: COMPARISION OF CONSTANT SCORE

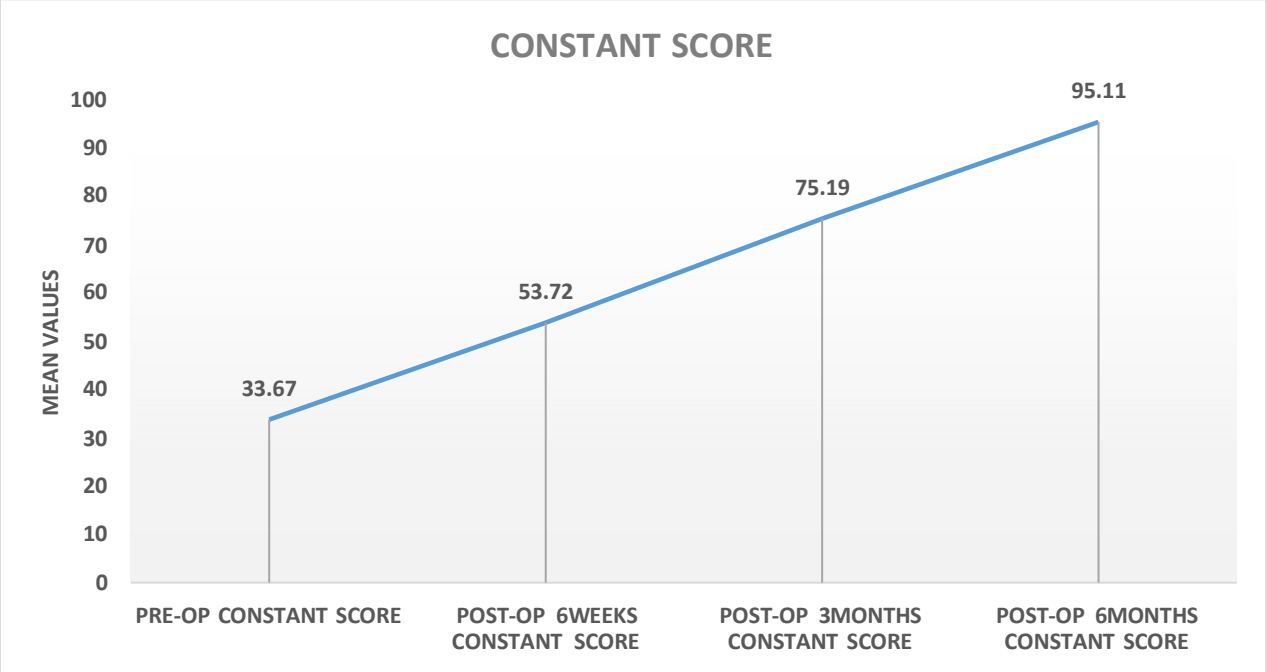
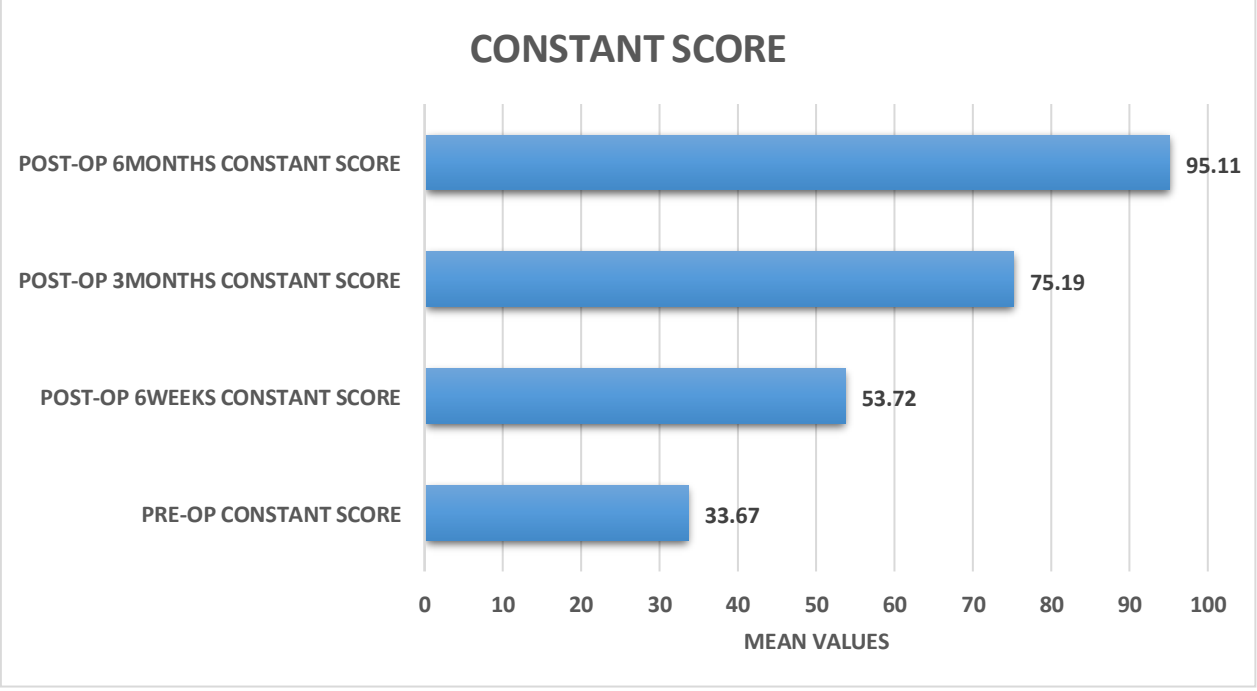


FIGURE 36: COMPARISION OF CONSTANT SCORE



DISCUSSION

Though non-operative therapy has still a place in the treatment of Acute AC joint injuries, in some of the selected cases it is highly agreed now that for more severe dislocations the surgical treatment has greater success. There are some issues related to implants used, such as implant failure, need for implant removal and therefore a second procedure/surgery might be needed for implant removal.

Various attempts have been made to modify the original Weaverdunn method of using nonmetallic fixation to support the AC joint. Even though many of these modifications have had great success, implant-related issues such soft tissue reaction, and fractures have been noted. Therefore, these implant-related issues led to the creation of solely biologic structures using allograft or autograft to repair the coracoclavicular complex.

Testing of strength, stiffness of various materials has been done to mimic postoperative conditions using both basic load to failure modes and reaction to cyclical loads. The significant failure rate of traditional techniques like the Weaverdunn has been proven to be explained by the fact that they are substantially more flexible and weaker than the original ligament. A variety of modifications to the original Weaverdunn approach is assessed using biomechanical tests.

The distal clavicle is dragged anteriorly by non-anatomical procedures such as cerclage fixation. There was osteolysis of the clavicle at the site of cerclage due to this malreduction, which most likely made the construct weaker during the recovery time because of exertion of continuous forces.

Implant stability is increased by placing it in proper anatomical places over clavicle and coracoid process of scapula. The mersilene device is physically positioned and replicates the coracoclavicular ligament's path. The device's stiffness and rigidity are around 40% more than those

of the natural ligament complex. Since only the interfaces of the two metal Endobuttons are susceptible to the deforming pressures brought on by the weight of the arm, suture material has a lower chance of soft tissue response.

Additionally, relatively small (2.7mm) drill holes allow the implant to be utilised either alone or in conjunction with other biologic implants, improving long-term stability. The procedure requires a tiny incision and is technically simple with little soft tissue dissection.

The study's objective is to assess the functional results of Rockwood type 4 and type 5 acromioclavicular joint disruptions managed using double endobuttons and fiber tape.

From January 1st, 2021, to May 31st, 2022, we treated 36 cases of Rockwood type 4 and 5 AC joint disruptions compared to 28 patients in a study by Ali Torkaman et.al.[54]

In our study we had 11 cases of Rockwood classification type 4 and 25 cases of Rockwood classification type 5 compared to 17 cases of Rockwood type 4 and 11 cases of Rockwood type 5 in the study done by Ali Torkaman et.al.[54] We had 33 male patients and 3 female patients while Ali Torkaman et.al;[54] had 24 male and 4 female patients in their study. Beris et.al;[4] included 12 patients in their study among whom 8 were Rockwood type 3 and 4 were Rockwood type 4 injuries and 9 were male and 3 were female patients. Our study's oldest patient is 51 years old, while the youngest is 22 years old.

There were 36 closed injuries. RTA is the most frequent method of injury (30 incidences), whereas slip and fall accidents account for 4 and 2 cases, respectively while 20 cases were RTA and 8 cases were slip & fall in a study by Ali Torkaman et.al.[54] Beris et.al;[4] reported 6 cases as RTA, 3 sports injuries and 3 falls.

We had 12 left-sided patients and 24 right-sided patients while Ali Torkaman et.al;[54] had 21 cases of right side and 7 cases of left side injuries in their study. Beris et.al;[4] reported 8 cases of right sided and 4 cases of left sided injuries in their study.

While Three individuals had the most frequent accompanying injury, a rib fracture, while other patients have fractures of the scapula (1 patient).

The mean time of injury to surgery was 1½ days while the range is 1 - 4 days compared to mean of 2.7days (range 1-5days) in a study by Ali Torkaman et.al.[54] Beris et.al;[4] reported a mean time from injury to surgery of 5 days in their study.

All wounds were opened with a vertical strap incision, the AC joint was reduced, and the wound was then repaired using two endobuttons and fiber tape.

The average surgical time was 70 minutes. Under image intensifier, the final fixation was evaluated. The surgical recovery period lasts for four to five days, and shoulder pendular exercises are begun in every case on the second post-op day.

At six weeks, three months, and six months following surgery, x-rays were obtained. The DASH Score and Constant score at 6 weeks, 3 months, and 6 months are used to evaluate the post-operative results of AC joint reconstruction. Active ROM and complete shoulder exercises began after four weeks.

Functional outcome is evaluated using DASH and Constant score.

Constant scores are generated by subjective and objective scoring, which takes into account factors including discomfort, everyday activities, range of motion, and muscular strength. 100 represents a perfect score, while 0 represents a failing grade.

The patient must respond to 30 items on the DASH questionnaire on daily life activities, pain, and confidence. The worst result is a score of 100, and the greatest result is a score of 0.

Pre operative DASH and Constant scores were 48.97 and 33.67 respectively, compared to pre-op DASH and constant scores of 20.79 and 33.54 respectively in a study by Ali Torkaman et.al.[54] Beris et.al;[4] had reported a mean pre-op DASH score of 19.6 and constant score of 34.41.

According to the Constant score and DASH score, 32 patients had an excellent result at the

last follow-up. 4 patients got good results. Constant score was 95 (ranging from 89 to 100), and DASH score was 5.3 (ranging from 2 to 10). These were the mean scores at the 6 months of post-op follow-up while the mean post-op DASH and constant scores were 1.43 and 89.36 respectively in a study by Ali Torkaman et.al.[54] Beris et.al;[4] reported a post-op DASH score of 0.25 and constant score of 94.66 in his study and concluded that 9 patients had excellent outcome and 3 patients had good outcome. Thus, the results of studies done by Ali Torkaman et.al.[54] & Beris et.al;[4] confirm the results our current study.

Neurological or vascular problems were not found. No patient experienced any functional impairments in our study. None of the patients had any implant related irritation or reactions.

Stitch granuloma was one (2.8%) of the post-operative complications, and shoulder stiffness was among the three (8.2%) instances while Ali Torkaman et.al;[54] reported 2 cases (7%) of heterotrophic ossification in their follow-up and Beris et.al;[4] reported no complications in his study.

In our study, we thoroughly examined the result of reconstruction from the operating table to complete functional recovery up to a maximum follow-up of 12 months. None of our cases at maximum follow-up has implant loosening or change in endobutton position. None of our cases had tissue reaction or infection to the nonabsorbable fibertape used. None of our cases had iatrogenic fractures at clavicle or coracoid during surgery or during follow-up period. This is due to 2.7mm drillbit we used for making drill holes. We did not use 4.5mm drillbit to make tunnels for endobutton fixation as done in few studies. Also, open reduction technique gives better orientation and thus prevents the iatrogenic fracture compared to the arthroscopic techniques.

CONCLUSION

We came to the following conclusions from the current study that evaluated the functional prognosis of Rockwood type 4 & 5 acute AC joint disruptions.

- Acromio-clavicular joint repair using double endobutton and biofiber tape provides stable and strong fixation which results in early rehabilitation, predictable functional recovery, and complete range of shoulder movements.
- Endobutton and fibertape provides the acromioclavicular joint with both vertical and horizontal stability.
- In our prospective study, intraoperative and postoperative complications were minimal as we have done open technique and used small size drill bits for making drill holes used for passing sutures and fixing the button.
- Endobutton usage eliminates implant related complications and additional 2nd surgery to remove implant unlike hook plate fixation and screw.

LIMITATIONS OF THE STUDY

- Ours study has limited sample size as our inclusion criteria were strict and we have short follow-up period of 12 months.
- Our study is a case series with level 4 evidence and a non-comparative. It is difficult to draw precise conclusions or to advise the procedure as treatment of choice with the available results.

DASH QUESTIONNAIRE

	No Difficulty	Mild Difficulty	Moderate Difficulty	Severe Difficulty	Unable
1. Open a tight or new jar.	☐ +1	☐ +2	☐ +3	☐ +4	☐ +5
2. Write	☐ +1	☐ +2	☐ +3	☐ +4	☐ +5
3. Turn a key	☐ +1	☐ +2	☐ +3	☐ +4	☐ +5
4. Prepare a meal	☐ +1	☐ +2	☐ +3	☐ +4	☐ +5
5. Push open a heavy door	☐ +1	☐ +2	☐ +3	☐ +4	☐ +5
6. Place an object on a shelf above your head	☐ +1	☐ +2	☐ +3	☐ +4	☐ +5
7. Do heavy household chores (e.g., wash walls, floors, etc.).	☐ +1	☐ +2	☐ +3	☐ +4	☐ +5
8. Garden or do yard work	☐ +1	☐ +2	☐ +3	☐ +4	☐ +5
9. Make a bed	☐ +1	☐ +2	☐ +3	☐ +4	☐ +5
10. Carry a shopping bag or briefcase.	☐ +1	☐ +2	☐ +3	☐ +4	☐ +5
11. Carry a heavy object (over 10 lbs)	☐ +1	☐ +2	☐ +3	☐ +4	☐ +5
12. Change a light bulb overhead	☐ +1	☐ +2	☐ +3	☐ +4	☐ +5
13. Wash or blow dry your hair	☐ +1	☐ +2	☐ +3	☐ +4	☐ +5
14. Wash your back.	☐ +1	☐ +2	☐ +3	☐ +4	☐ +5
15. Put on a pullover sweater	☐ +1	☐ +2	☐ +3	☐ +4	☐ +5
16. Use a knife to cut food.	☐ +1	☐ +2	☐ +3	☐ +4	☐ +5
17. Recreational activities which require little effort (e.g., cardplaying, knitting, etc.)	☐ +1	☐ +2	☐ +3	☐ +4	☐ +5
18. Recreational activities in which you take some force or impact through your arm, shoulder, or hand (e.g., golf, hammering, tennis, etc.)	☐ +1	☐ +2	☐ +3	☐ +4	☐ +5
19. Recreational activities in which you move your arm freely (e.g., playing frisby, badminton, etc.)	☐ +1	☐ +2	☐ +3	☐ +4	☐ +5
20. Manage transportation needs (getting from one place to another)	☐ +1	☐ +2	☐ +3	☐ +4	☐ +5
21. Sexual Activities	☐ +1	☐ +2	☐ +3	☐ +4	☐ +5

	Not At All	Slightly	Moderately	Quite A Bit	Extremely
22. During the past week, to what extent has your arm, shoulder, or hand problem interfered with your normal social activities with family, friends, neighbors, or groups?	☐ +1	☐ +2	☐ +3	☐ +4	☐ +5

	Not Limited At All	Slightly Limited	Moderately Limited	Very Limited	Unable
23. During the past week, were you limited in your work or other regular daily activities as a result of your arm, shoulder, or hand problem?	☐ +1	☐ +2	☐ +3	☐ +4	☐ +5

	None	Mild	Moderate	Severe	Extreme
24. In the last week, please rate the severity of arm, shoulder, or hand pain	☐ +1	☐ +2	☐ +3	☐ +4	☐ +5
25. In the last week, please rate the severity of arm, shoulder, or hand pain when you performed any specific activity	☐ +1	☐ +2	☐ +3	☐ +4	☐ +5
26. In the last week, please rate the severity of tingling (pins and needles) in your arm, shoulder, or hand	☐ +1	☐ +2	☐ +3	☐ +4	☐ +5
27. In the last week, please rate the severity of weakness in your arm, shoulder, or hand	☐ +1	☐ +2	☐ +3	☐ +4	☐ +5
28. In the last week, please rate the severity of stiffness in your arm, shoulder, or hand	☐ +1	☐ +2	☐ +3	☐ +4	☐ +5

	No Difficulty	Mild Difficulty	Moderate Difficulty	Severe Difficulty	Cannot Sleep
29. During the past week, how much difficulty have you had sleeping because of the pain in your arm, shoulder, or hand?	☐ +1	☐ +2	☐ +3	☐ +4	☐ +5

	Strongly disagree	Disagree	Neither agree nor disagree	Agree		Strongly agree
30. I feel less capable, less confident or less useful because of my arm, shoulder or hand problem	☐ +1	☐ +2	☐ +3	☐ +4		☐ +5

DASH Score (100 points): _____

CONSTANT SCORE

A: Pain Score

Indicate the highest pain level you have experienced in your shoulder during ordinary activities within the last 24 hours.

Intolerable pain (0) No pain (15)

B. Activities of daily living

The next 4 questions deal with everyday activities you experienced over the last week.

1. Is your sleep disturbed by your shoulder? (Please check only one box)

☐ Undisturbed sleep (+2) ☐ Occasional disturbance (+1) ☐ Every night (+0)

2. How much of your normal daily work does your shoulder allow you to perform?

None (0) All (4)

3. How much of your normal recreational activity does your shoulder allow you to perform?

None (0) All (4)

4. To which level can you use your hand comfortably? (Please check only the most advancement movement)

☐ Below the waist (+0) ☐ Up to the waist (+2) ☐ Up to the xiphoid/sternum (+4)

☐ Up to the neck (+6) ☐ Up to the top of the head (+8) ☐ Above the head (+10)

C. Movement

Four different active and pain-free movements of the arm are performed. If the arm can be lifted to 140 degrees with pain and 110 degrees without pain in question 1,2, then a range of motion of 110 degrees is recorded. The tester first shows the desired movement, which the patient then performs. All exercises are done with the test subject standing with their feet pointing directly forwards and a shoulder width apart.

1,2. Forward and lateral elevation are recorded with a long-armed goniometer. Only the affected arm performs movements. Please check one box.

	Range of Motion (degrees)					
Movement	0-30	31-60	61-90	91-120	121-150	≥151
Flexion						
Abduction						
Points	0	2	4	6	8	10

3. External rotation performed without help and the hands should be placed behind and above the head without touching the head. Movements are performed by both arms simultaneously but recorded only for the affected side. The movements must be performed painlessly. Please check all that apply.

☐ Hands behind head, elbows forward (+2) ☐ Hands behind head, elbows back (+2)

☐ Hands to the top of the head, elbows forward (+2) ☐ Hands to the top of the head, elbows back (+2)

☐ Full elevation of the arms (+2)

3. Internal rotation is performed without help and the subject should use their thumb to point to the specified anatomic landmarks. Movements are performed only with the affected arm. The movements must be performed painlessly. Please check only the box for the most advanced movement.

☐ Lateral aspect of the thigh (+0) ☐ Behind the buttock (+2) ☐ Sacroiliac joint (+4)

☐ Waist (+6) ☐ 12th thoracic vertebra (+8) ☐ Interscapular level (+10)

D. Strength

Strength is measured with a dynamometer. The test is done with the test subject standing with t heir feet pointing directly forwards and a shoulder width apart. The arm should be abducted 90 degrees in the scapular plane. If the arm cannot be elevated to 90 degrees, a score of 0 points is given. The wrist is pronated so the palm faces down and the elbow is stretched as much as possible. The strap of the dynamometer should be placed around the wrist of the test subject so that it lies over the long head of the ulna. The test subjected is instructed to push maximally upwards for 5 seconds and is given 3 attempts.

	1st attempt	2nd attempt	3rd attempt	Best score
Strength (lbs)				

Scoring Instructions:

A. Pain (max 15 points)

Points are calculated by the equation: 15 – X = Score; X is the measured distance (cm) from "no pain" to the mark (use a ruler). If the value includes a decimal, round up or down to the closest integer:

_____points

B. Activities of daily living (max 20 points)

1. Sleep: Points are given in parenthesis:

_____points

2. Normal daily living: The score is given by measuring the distance (cm) from "All" to the mark (use a ruler): 0-3cm = 4 points, >3-6cm = 3 points, >6-9cm = 2 points, >9-12cm = 1 point, >12-15cm = 0 points:

_____points

3. Normal recreation activity: The score is given by measuring the distance (cm) from "All" to the mark (use a ruler): 0-3cm = 4 points, >3-6cm = 3 points, >6-9cm = 2 points, >9-12cm = 1 point, >12-15cm = 0 points:

_____points

4. Hand comfort: Points are given in parenthesis:

_____points

C. Movement (max 40 points)

1,2. Forward and lateral elevation: Points are listed in the table:

Flex

ion:_____points Abduction:_____points

3. External rotation: Sum points from each separate completed movement:

_____points

4. Internal rotation: Points are given in parenthesis.

_____points

D. Strength (max 25 points)

The score is calculated from the highest score of 3 attempts. The score in points corresponds to the force in pounds (max 25 points). If the strength is measured in kilograms, calculate scores by multiplying by 2.2.

_____points

Constant Murley Score (max 100 points)

Sum of points:_____points

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PROFORMA

Case no. :

Follow-up no. :

Name :

Age/sex :

IP no :

Date of admission :

Date of surgery :

Date of discharge :

Occupation :

Residence :

Presenting complaints with duration :

History of presenting complaints :

Family History :

Personal History :

Past History :

Gait:

Attitude:

Local examination:

Right/ Left Shoulder

Inspection:

a) Attitude

b) Abnormal swelling

- Site
- Size
- Shape
- Extent

c) Skin condition

d) Compound injury if any

Palpation:

a) Swelling
b) Local tenderness
c) Bony irregularity
d) Abnormal movement
e) Wound

Movements:	Active	Passive
Flexion		
Extension		
Internal rotation		
External rotation		
Adduction		
Abduction		

Intra-op details:

1. Approach
2. Technique - Double button fixation with fiber tape
3. Time taken for surgery

Complications:

Immediate

1. Infection
2. Wound breakdown

Postop at 6week, 3months, and 6months

1. Loss of fixation/reduction
2. Implant failure
3. Implant irritation
4. Need for re-surgery

DASH Score:

Constant Score:

B.L.D.E. (DEEMED TO BE UNIVERSITY) SHRI B.M. PATIL MEDICAL COLLEGE HOSPITAL AND RESEARCH CENTER, VIJAYAPURA -586103.

INFORMED CONSENT FOR PARTICIPATION IN DISSERTATION/RESEARCH

I, the undersigned,_____, S/O D/O W/O_____, aged ____years, ordinarily resident of_____do hereby state/declare that Dr. Mallipudi Venkat of Shri B. M. Patil Medical College Hospital and Research Centre has examined me thoroughly on_____at_____(place) and it has been explained to me in my own language that I am suffering from_____disease (condition) and this disease/condition mimic following diseases. Further Dr. Mallipudi Venkat has informed me that he/she is conducting dissertation/research titled "clinical outcomes of type IV and type V acute acromioclavicular joint dislocation treated with double button fixation – a prospective study" under the guidance of Dr. Sandeep Naik requesting my participation in the study. Apart from routine treatment procedure, the pre-operative, operative, post-operative and follow-up observations will be utilized for the study as reference data.

The doctor has also informed me that adverse results may be encountered during this procedure. Most of them are treatable but are not anticipated; hence there is a chance of aggravation of my condition. In rare circumstances, it may prove fatal despite the anticipated diagnosis and best treatment made available. The further doctor has informed me that my participation in this study help in the evaluation of the results of the study, which is a useful reference to the treatment of other similar cases in the near future, and also I may be benefited from getting relieved of suffering or a cure from the disease I am suffering.

The doctor has also informed me that information given by me, observations made/ photographs/ video graphs taken upon me by the investigator will be kept secret and not assessed by the person other than my legal hirer or me except for academic purposes.

The doctor did inform me that though my participation is purely voluntary, based on the information given by me, I can ask for any clarification during the course of treatment/study related to diagnosis, the procedure of treatment, the result of treatment, or prognosis. I have also been informed that I can withdraw from my participation in this study at any time if I want,

or the investigator can terminate me from the study at any time from but not from the procedure, treatment, and follow-up unless I request to be discharged.

After understanding the nature of dissertation or research, diagnosis made, mode of treatment, I the undersigned Shri/Smt_____under my full conscious state of mind agree to participate in the said research/dissertation.

Signature of the patient:

Signature of the doctor:

Witness: 1.

2.

Date:

Place:

MASTER CHART

L.	NATIENT NAI	AGE	SEX	ATIENT	DDE OF INJU	E OF INJU	VOOD CLASSIFICATI	OCIATED INJU	E TO SURG	MPLICATI	OP DASH SC	OP 6 WEEKS DASH	OP 3MONTHS DASH	OP 6MONTHS DASH	OP CONSTANT S	P 6WEEKS CONSTANT	P 3MONTHS CONSTAN	P 6MONTHS CONSTANT SCORE
1	PRAHALAD	38	M	313049	RTA	RIGHT	TYPE 5	NIL	2DAYS	NONE	47.5	39.2	21.7	2.5	31	53	75	97
2	MALAPPA	50	M	84589	RTA	LEFT	TYPE 5	NIL	2DAYS	NONE	40	25.8	15	4.2	49	68	81	98
3	SANGAPPA	44	M	121908	RTA	RIGHT	TYPE 5	NIL	3DAYS	NONE	45.8	35.8	18.3	4.2	39	58	78	95
4	VINOD	26	M	115713	RTA	LEFT	TYPE 5	NIL	1DAY	NONE	44.2	37.5	23.3	2.5	32	52	72	94
5	SUJATHA	36	F	132049	RTA	LEFT	TYPE 4	NIL	1DAY	NONE	45	33.2	18.4	3.3	28	54	77	93
6	SAGAR	29	M	140172	RTA	RIGHT	TYPE 4	NIL	3DAYS	NONE	58.3	40	21.4	5	35	53	73	97
7	DEVENDRA	34	M	147671	SLIP INJURY	LEFT	TYPE 4	NIL	2DAYS	NONE	47.5	38.3	22.6	5	38	55	71	92
8	VIJAY	22	M	156122	RTA	LEFT	TYPE 4	NIL	1DAY	NONE	45.8	40.8	18.4	4.2	28	56	75	96
9	RAMESH	25	M	156111	RTA	RIGHT	TYPE 5	RIB FRACTURE	2DAYS	NONE	46.7	40	20.4	3.3	35	53	76	94
10	SHREEDHAI	27	M	136530	RTA	RIGHT	TYPE 5	NIL	3DAYS	NONE	45.8	39.2	21.3	2.5	30	52	74	100
11	REKHA	35	F	163541	SLIP INJURY	RIGHT	TYPE 4	NIL	1DAY	NONE	46.6	37.4	18.4	4.8	31	57	77	94
12	BHIMAPPA	44	M	171453	L FROM HEI	RIGHT	TYPE 4	NIL	2DAYS	NONE	43.8	35.4	22.4	5.8	32	55	73	94
13	MOHAN	25	M	221644	RTA	LEFT	TYPE 4	NIL	3DAYS	NONE	51.4	38	20.4	6.3	37	56	74	89
14	PRABHU	24	M	231860	RTA	LEFT	TYPE 5	NIL	3DAYS	NONE	48.6	33.6	19.4	9.2	42	50	70	96
15	HARISH	39	M	255177	RTA	RIGHT	TYPE 5	RIB FRACTURE	1DAY	NONE	52.6	39.4	18.3	8.3	36	56	80	95
16	ANIL	34	M	236502	RTA	RIGHT	TYPE 5	NIL	1DAY	H GRANUL	48.3	40.2	16.4	4.6	31	60	78	97
17	PRADEEP	40	M	275983	SLIP INJURY	RIGHT	TYPE 4	NIL	1DAY	NONE	44.6	37.4	12.6	5	33	53	77	95
18	SUMAN	36	M	280457	RTA	RIGHT	TYPE 5	NIL	4DAYS	NONE	55.2	40.2	15.4	3.8	31	50	79	96
19	SANTOSH	35	M	344447	RTA	LEFT	TYPE 5	NIL	1DAY	NONE	47.5	36.4	18.3	3.3	37	51	73	97
20	IRANNA	47	M	25577	RTA	LEFT	TYPE 5	APULA FRACTU	2DAYS	NONE	50.8	40.2	19.4	6.8	29	58	80	93
21	PRASHANT	52	M	367447	L FROM HEI	RIGHT	TYPE 5	NIL	2DAYS	NONE	56	41.6	18.2	5.9	32	54	74	97
22	RAVINDRA	42	M	255688	RTA	RIGHT	TYPE 5	NIL	2DAYS	NONE	40	30.8	19.3	4.1	38	51	78	100
23	NAVEEN	30	M	198876	RTA	RIGHT	TYPE 4	RIB FRACTURE	1DAY	NONE	53.8	42.4	17.2	3.9	37	53	76	95
24	NAGESH	39	M	123455	RTA	RIGHT	TYPE 5	NIL	4DAYS	NONE	46.7	37.4	18.5	5.8	30	51	67	94
25	HONAPPA	32	M	166778	RTA	RIGHT	TYPE 5	NIL	3DAYS	LDER STIFI	44.2	35.6	16.2	9.6	33	46	68	96
26	GOPAL	51	M	258669	RTA	RIGHT	TYPE 5	NIL	3DAYS	NONE	53.9	44.7	16.4	4.6	30	51	76	97
27	KALLAPPA	47	M	266778	RTA	RIGHT	TYPE 4	NIL	3DAYS	NONE	49.4	38.6	20.2	7.6	34	55	78	96
28	UMESH	28	M	345756	SLIP INJURY	RIGHT	TYPE 5	NIL	3DAYS	NONE	51.8	39.4	18.8	5.8	31	53	79	94
29	SURESH	36	M	300851	RTA	LEFT	TYPE 5	NIL	2DAYS	NONE	48.2	40.2	15.4	4.6	36	57	78	97
30	SACHIN	33	M	291677	RTA	LEFT	TYPE 4	NIL	2DAYS	NONE	45.8	32.6	14.8	8.6	31	55	80	94
31	RAJESH	36	M	268778	RTA	LEFT	TYPE 5	NIL	4DAYS	LDER STIFI	58.2	40.8	16.4	8.4	35	56	77	96
32	SHANTHA	29	F	34555	RTA	RIGHT	TYPE 5	NIL	2DAYS	NONE	56.2	38.8	24.2	2.6	31	51	80	94
33	DILEEP	33	M	148666	RTA	RIGHT	TYPE 5	NIL	1DAY	LDER STIFI	57.5	44.3	23.6	7.8	32	50	70	90
34	ANUMANT	22	M	268485	RTA	RIGHT	TYPE 5	NIL	1DAY	NONE	44.2	31.6	19.4	3.7	37	56	73	94
35	ARJUN	30	M	386888	RTA	RIGHT	TYPE 5	NIL	2DAYS	NONE	50.4	38.6	21.3	8.6	30	47	69	92
36	ANGAMESI	28	M	25656	RTA	RIGHT	TYPE 5	NIL	2DAYS	NONE	47.8	37.4	22.6	4.7	31	48	71	96

ETHICAL CLEARANCE CERTIFICATE

IEC/No-10/21
Date-22/01/2021

B.L.D.E. (DEEMED TO BE UNIVERSITY)

(Declared vide notification No. F.9-37/2007-U.3 (A) Dated. 29-2-2008 of the MHRD, Government of India under Section 3 of the UGC Act, 1956)

The Constituent College

SHRI. B. M. PATIL MEDICAL COLLEGE, HOSPITAL AND RESEARCH CENTRE

INSTITUTIONAL ETHICAL CLEARANCE CERTIFICATE

The Institutional ethical committee of this college met on 11-01-2021 at 11 am to scrutinize the synopsis of Postgraduate students of this college from Ethical Clearance point of view. After scrutiny the following original/corrected and revised version synopsis of the Thesis has been accorded Ethical Clearance

Title: Clinical outcomes of Type IV and Type V acute acromioclavicular joint dislocation treated with double button fixation – A prospective study.

Name of PG student : Dr Mallipudi Venkat, Department of Orthopaedics

Name of Guide/Co-investigator : Dr Sandeep Naik, Associate.Professor of Orthopaedics

DR .S.V.PATIL
CHAIRMAN, IEC
Institutional Ethical Committee
B L D E (Deemed to be University)
Shri B.M. Patil Medical College,
VIJAYAPUR-586103 (Karnataka)

Following documents were placed before Ethical Committee for Scrutinization:

1. Copy of Synopsis / Research project
2. Copy of informed consent form
3. Any other relevant documents.

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