



## *International Journal of Orthopaedics Sciences*

E-ISSN: 2395-1958  
P-ISSN: 2706-6630  
IJOS 2020; 6(2): 107-112  
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www.orthopaper.com  
Received: 19-01-2020  
Accepted: 21-02-2020

**Dr. Bansod Satishkumar**  
P.G. Resident, Department of  
Orthopaedics, RNTMC, Udaipur,  
Rajasthan, India.

**Dr. AK Mehra**  
Professor and Head, Department  
of Orthopaedics, RNTMC,  
Udaipur, Rajasthan, India.

**Dr. Rajulal Yadav**  
Sr. Resident, Department of  
Orthopaedics, RNTMC, Udaipur,  
Rajasthan, India.

**Corresponding Author:**  
**Dr. Bansod Satishkumar**  
P.G. Resident, Department of  
Orthopaedics, RNTMC, Udaipur,  
Rajasthan, India.

### **“Study on functional outcome of reconstruction of acromioclavicular joint dislocations type III to type VI using tight rope with endobutton”**

**Dr. Bansod Satishkumar, Dr. AK Mehra and Dr. Rajulal Yadav**

**DOI:** <https://doi.org/10.22271/ortho.2020.v6.i2b.2026>

#### **Abstract**

**Introduction:** Acromioclavicular joint are common in physical active young adults, mostly involves in sports activities. Its male predominant and account 9% of all shoulder injuries. Tight rope and endobutton reduces the chances of clavicular fracture across the tunnels and avoids hardware related complications.

**Aims and Objectives:** To study functional outcome of acromioclavicular joint dislocation by using tight rope and endobutton.

**Materials and methods:** This is prospective study of 25 cases of AC joint dislocations type iii to vi admitted between oct 2017 to march 2019. Out of 25 only 16 patients was operated. In procedure, clavical tunnel made, tight rope passed around coronoid process and through clavicular tunnel and secure with endobutton.

**Observations and Results:** In our study M:F of 17:8 and mean age of 44 years having right side predominance, average blood loss 150 ml functional outcome by CONSTANT score got 4 complications. 8 patients got excellent result, 6 good, 2 adequate results.

**Conclusions:** AC joint dislocation type iii to type iv using tight rope with endobutton have excellent result give less complications and rigid fixation with extensive tensile strength allowing physiological motion between clavical and corocoid, endobutton avoid stress concentration over bone bridge between the two tunnels. Tight ropes prevents necessities of biological tendinous graft.

**Keywords:** Acromioclavicular joint (AC joint), endobutton, tight rope.

#### **Introduction**

Acromioclavicular joint dislocation is a common shoulder injury in physically active young adults, it accounts for 9% of all shoulder injuries. From clinical diagnosis to treatment has gone phases of innovation in last few decades. Earlier described techniques were reduction with tight bandage, Bosworth screw fixation, tension band wiring have been replaced by new techniques like transfer of coracoacromial ligament (Weaver Dunn Procedure), reconstruction of AC joint with the help of autogenous graft and hook plate. My study is on stabilization of Acromio clavicular joint by new technique using tight rope with endobutton fixation.

Incidence is more in males who are participating in contact sports like rugby, basket ball, hockey, cyclist who fall over handlebars. Literature says the incidence is 3-4/1,00,000 population and 25 to 52% falling during sporting activity <sup>[1]</sup> Overall incidence is 1.8 per 10000 in American population. Male to female ratio is 5 to 8.5:1. 50.5% of all dislocations occurs in the age group between 20-39 years. The most common type is rockwood type III. The most common mechanism of injury is sports injuries seen in contact sports athletes <sup>[2]</sup>. In (460–377BC), Hippocrates mentioned about acromioclavicular joint dislocations in his literature. Galen (129–199 AD) diagnosed his own AC dislocation received from wrestling in the Palaestra and he treated himself with tight bandages to depress the clavicle and elevate the arm.

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

lateral end of clavicle with coracoacromial ligament transfer(Weaver Dunn procedure), but these procedures reported with more number of complication and the results are not satisfactory. For better outcome it is important to know about the anatomy and biomechanics of shoulder joint and acromioclavicular joint. By reconstructing both the acromioclavicular and coracoclavicular ligaments with Tight Rope with endobutton it is possible to restore the near normal anatomy and stability (anteroposterior & vertical stability) of AC joint and good range of movements. It has the advantage of avoiding second surgery for implant removal, hardware related complications like hardware prominence, implant breakage. Endobutton reduces the chances of clavicular fractures across the tunnels.

### Material and Method

This study was a prospective study done on 25 consenting cases of acromioclavicular joint dislocation admitted to R.N.T. Medical College & M.B. Hospital during October 2017 to March 2019 chosen based on the inclusion and exclusion criteria.

Patients were informed about the study in all respects and written informed consent will be obtained. The follow up period was 4 weeks, 2 months, 6 months.

### Inclusion Criteria

1. Acromioclavicular joint dislocation rockwood type III to type VI
2. Age 20 years and above of either sex.
3. Acromioclavicular joint dislocation less than 4 weeks of duration.

### Exclusion Criteria

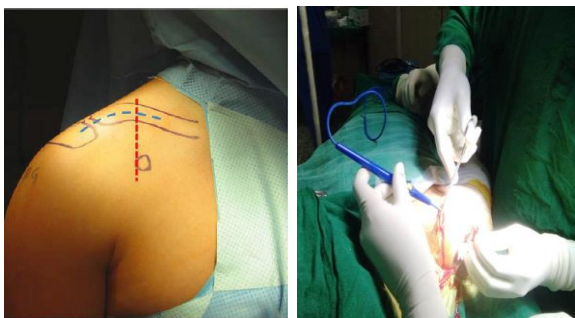
1. Comorbid conditions not permitting major surgical procedures
2. Patients with rockwood type I & II
3. Poor local skin conditions
4. Age less than 20 years
5. Open Injuries.

### Surgical Technique

Patients with acromioclavicular joint ligament disruption type III to type VI was immobilized with clavicle brace. Once the patient selected for surgery, preoperative planning and investigations were done and the patients were posted for surgical intervention.

### Position: Beech Chair Position

- 1) Incision- 5cm incision made from the tip of Coracoid process to lateral end of clavicle.



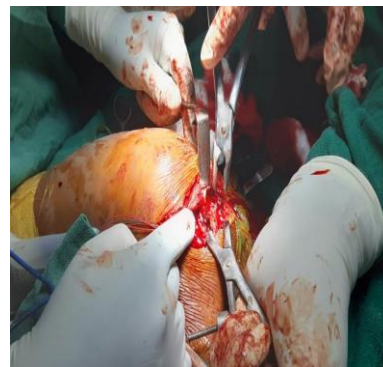
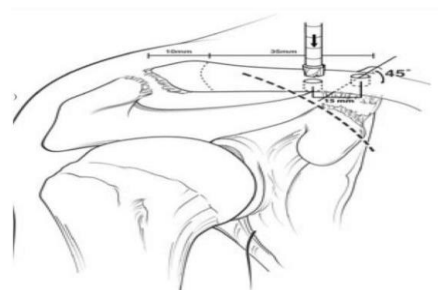
- 2) Skin subcutaneous tissue incised



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

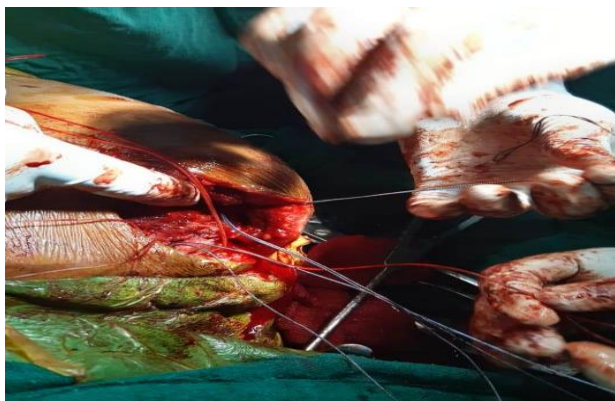


- 4) Clavicular Tunnels:  
Conoid tunnel: 45mm medial to lateral end of clavicle (posteromedial)  
Trapezoid tunnel: 30 mm medial to lateral end of clavicle (anteriolateral) 1cm of lateral end clavicle osteotomy done

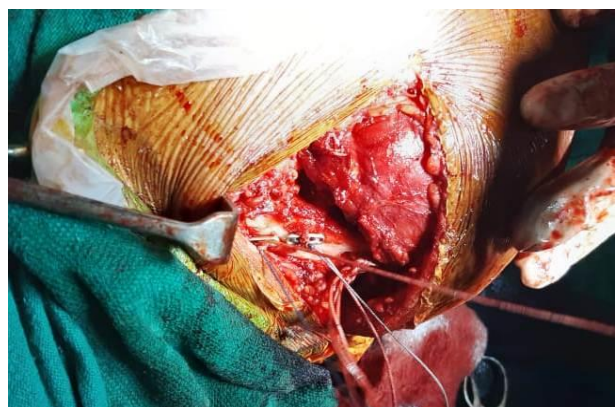


- 5) Corocoid process exposed through longitudinal split. Tight rope passed around the corocoid process and through the clavicular tunnels.

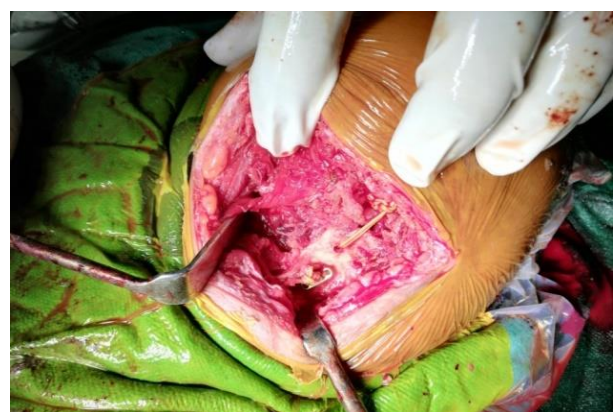




6) Reduction tried and secured with endobutton



7) After that tight rope are tie with AC joint.



8) Wound closed and sterile dressing applied.

### Post Operative Care

Parenteral antibiotics continued for first five days and then shifted to oral.

- Shoulder immobilizer given to support shoulder joint.
- X-ray on 3<sup>rd</sup> post-operative day.
- Dressing change on 3<sup>rd</sup> post - operative day.
- Sutures removed on 12<sup>th</sup> post-operative day.
- Pendulum exercise for first four weeks
- Active assisted abduction exercise started after 4 weeks.
- Muscle strengthening exercise after 8 weeks.

### Follow Up:

- 4weeks, 2months, 1 year after surgery.
- Radiological evaluation – X-ray, Shoulder joint with clavicle.
- In each follow up evaluation was done as per

### CONSTANT and MURLEY SCORING,

- CONSTANT AND MURLEY SCORING :

A) Subjective	B) Objective :
1) Pain-15 Points No pain - 15 Bearable pain - 10 Disabling pain – 5	RANGE OF MOVEMENTS : 40 a) Active flexion without pain 00 – 30 Degrees : 00 31-60 Degrees : 2 61-90 Degrees : 4 91-120 Degrees : 6
2) Activities of daily living : - 20 Ability to perform full work - 04 Ability to perform Leisure activities/Sports – 04 Unaffected sleep – 02	b) Functional external rotation : Hand behind head with elbow forwards - 2 Hand behind head with elbow backwards - 4 Hand above head with elbow forwards - 6 Hand above head with elbow backwards - 8 Full elevation from on top of head – 10
3)Level at which work can be done : Up to Waist - 02 Up to Xyphoid - 04 Up to Neck - 06 Up to Head - 08 Above head – 10	c) Active abduction without pain : With dorsum of hand on back, head of third metacarpal reaches 00 – 30 Degrees : 00 31-60 Degrees : 2 61-90 Degrees : 4 91-120 Degrees : 6 121-150 Degrees : 8 > 151 Degrees : 10
	d) Functional internal rotation : Ipsilateral buttock : 2 S1 spinous process : 4 L3 spinous process : 6 T12 spinous process : 8 T7 spinous process : 10
	e) Strength of abduction : 25 Points A normal shoulder in a 25 year old man resists 25 pounds without difficulty. The score given for normal power is 25 points, with proportionately less for less power.

- Patients were graded as below with a maximum of 100 points
- Total score Result
- 91-100 Excellent
- 81-90 Good
- 71-80 Satisfactory
- 61-70 Adequate

### Results

In this study 16 patients were operated with this procedure out of which 13 male & 3 female patients. Age of the patient ranges from 23-65years with the mean age of 44 years. Right sided involvement is more in my study. Mode of injury is more with road traffic accident(62.5%). Average blood loss during the procedure was range 120-160 ml and the mean operating time was 103mins(range 90-120mins). Functional outcome by constant score. Radiological outcome by taking zanca view to assess the amount of reduction and to rule out clavicle or coracoid fracture.

Two patients with surgical site complication and one patient has restricted range of motions and one patient as loss of reduction. One patient had paresthesia over surgical site for 3 months and recovered fully in the next follow-ups. One patient had superficial infection over the surgical site and treated with antibiotics

**Table 1:** Constant Score Outcome

Score	No. of Patients
91-100 (Excellent)	8
81-90 (Good)	6
71-80 (Satisfactory)	0
61-70 (Adequate)	2

**Table 2:** Blood Loss

Patient's Name	Blood Loss (ml)
Anurag	120
Prakash	150
Tulsiram	120
Kantilal	160
Amratlal	130
Kanhayalal	130
Ramlal	120
Vimal Ji	150
Premshankar	140
Mahendra	160
Valaram	160
Kishan	150
Vikram	120
Shyamubai	130
Kali Bai	130
Ratnibai	160

**Table 3:** Operative Time

Name	Operative Time
Anurag	90
Prakash	110
Tulsiram	95
Kantilal	120
Amratlal	90
Kanhayalal	120
Ramlal	110
Vimal Ji	95
Premshankar	120
Mahendra	90
Valaram	110
Kishan	110
Vikram	100
Shyamubai	90
Kalibai	110
Ratnibai	95

**Table 4:** Preop and Post Op constant and murley score

Name	Preop Constant Score	Post Op Constant Score
Anurag	17	94
Prakash	15	96
Tulsiram	19	92
Kantilal	11	63
Amratlal	20	91
Kanhayalal	21	92
Ramlal	17	90
Vimal Ji	15	94
Premshankar	21	84
Mahendra	19	86
Valaram	15	91
Kishan	17	89
Vikram	17	92
Shyamubai	10	67
Kalibai	21	90
Ratnibai	20	86

**Case – Functional And Radiological Outcome****Pre Op Clinical Photo****Pre Op X Ray****Intra Op Picture**



**Intra op X-ray****Post op X-ray****Folloe Up Clinical Picture (1 Years)****Table 5:** Complications in this study

Complication	Frequency
Wound Infection	1
Paresthesia	1
Restriction Of Movements	1
Loss Of Reduction	1

### Discussion

Acromioclavicular joint disruption accounts for 9% of all shoulder abnormalities it is most commonly seen in young athletes who are participating in contact sports. In low grade injuries type I type II injuries are most common and it is most commonly treated by conservative measures with Jones's strapping and ice application. Surgical treatment for type III ac joint injuries are controversial. Some authors suggest conservative and some prefer surgical treatment. Nevaizer *et al.*, proposed a classification system to plan the treatment for type III acromioclavicular injuries in that if the ac joint reduces with upward pressure conservative treatment can be advised if ac joint is not reduced with upward pressure surgical treatment is preferred. Rockwood type IV to Type VI injuries are high grade injuries in which acromioclavicular coracoclavicular ligaments disruptions associated with button holing into trapezius or tear of deltoid, trapezius, or clavicular displacement to the undersurface of biceps tendon may occur. But in our study all type III to Type VI injuries were included. Out of 25 patients of type III to Type VI injuries 5 patients were not willing for surgery, 3 patients had associated clavicle and neck of scapula fractures and one patient of rockwood type III was not assessed due to lower respiratory infection and COPD. All these patients were excluded from the study. Total of 16 patients were underwent surgery with this technique.

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

All the patients were operated only after obtaining informed consent. 10 patients were operated under General anaesthesia and 6 patients were operated under intersclenae block. In beach chair position, vertical incision made from the lateral end of clavical to coracoid process. Skin subcutaneous tissue incised and retracted. Skeletonization of clavicles done by elevating flaps from deltoid and trapezius. Xue *et al.* conducted a study to asses the anatomic land mark of conoid and trapezoid ligament and he measured the distance from the acromion with this reference we made conoid and trapezoid tunnels. Conoid tunnel was made posterior and medial at the junction of middle and lateral third of clavicle (4.5cm from acromion) and trapezoid tunnels was made 1 cm anterior and lateral to the previous tunnel. These tunnels were nearly anatomical to the native foot print of coraco clavicular ligaments.

Tight Rope passed through tunnels and fixed with endobutton to secure primary reduction. None of my patients reported with clavicle or coracoids fracture. AC joint also reconstruct with tight rope. None of the patients received blood transfusion and post operative ventilatory care.

Post operative rehabilitation done according to the protocol. Patients were followed up to one year to asses the pain, range of movements and zanca view taken to asses the reduction constant score were used to asses the outcome.

### Advantages

1. Reconstruction of both acromioclavicular and coracoclavicular ligaments.
2. Preserves coracoacromial ligament.
3. Tight rope gives strength and stiffness similar to that of intact ligament.
4. Augmentation enables to shield the repair and reconstruction from extensive tensile force while allowing physiological motion between clavicle and coracoids.
5. Endobutton avoids the stress concentration over the bone bridge between the two tunnels.
6. Coracoids is not drilled so coracoids fracture like complications avoided.

### Conclusion

Acromioclavicular joint disruption type III-type VI reconstruction by using tight rope with Endo button. Strength of the tight rope is similar to the coracoclavicular ligaments. Reconstruction of both acromioclavicular and coracoclavicular ligaments is done to recreate the near normal anatomy of AC joint. Two tunnel created according to the position of the coracoclavicular ligaments and coracoids is not drilled instead of that the tight rope is passed under the coracoid without disturbing the conjoint tendon Endobutton and tight rope is used to secure primary reduction. Tight rope also fixed to the acromion to recreate the acromioclavicular ligaments

Reconstruction of both acromioclavicular and coracoclavicular ligaments, Preserves coracoacromial ligament, Augmentation with tight rope gives strength and stiffness similar to that of intact ligament, Augmentation enables to shield the repair and reconstruction from extensive

tensile force while allowing physiological motion between clavicle and coracoids, Endobutton avoids the stress concentration over the bone bridge between the two tunnels, Coracoids is not drilled so coracoids fracture like complications avoided, Distal clavicle osteotomy prevents early degenerative osteoarthritic changes and osteolysis.

From this study I conclude that reconstruction with tight rope with endobutton provides near normal anatomical reconstruction of Acromioclavicular joint with ligament complex (AC&CC) with better stability and mobility

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