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Operative outcome of acromioclavicular joint dislocation: Coracoclavicular ligament reconstruction through non absorbable suture fixation

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Abstract

Introduction: Approximately 12% of all acute shoulder injuries affect the acromioclavicular joint. Grade I–II injuries are treated conservatively, without surgery, leading to satisfactory results and a return to sporting activity in most cases. The treatment of grade III injuries is controversial. However, surgical treatment is recommended for high grade 4 to 6. Appreciation of anatomical structures that provide the acromioclavicular joints stability is vital for successful and sustainable treatment.

Method and Material: 11 patients (8 males and 3 females) who had high grade acromioclavicular joint injury were operated from July 2019 to January 2020. All patients were assessed clinically, radiologically and classified according to rockwood classification. Patients were selected on basis of inclusion and exclusion criteria. Coracoclavicular Ligament reconstruction was done using ethibond 5.

Post-operative rehabilitation: Post operatively arm sling was given for 6 weeks. Passive range of motion started with pendulum exercise, towel slides, internal and external rotation, scapula protraction, retraction followed by active range of motion wall slides with trunk, bilateral and unilateral pull with trunk rotations, deltoid trapezial complex work. Patient returned to his routine work after six month.

Results: All the patients were followed up clinically and radiologically. The mean constant score increased from 51.09 preoperatively to 83.81 postoperatively at followup. All the patients had resumed their activity by 6 months postoperatively. No loss of reduction and no complication was observed at follow-up.

Discussion: Currently, the 4 main surgical options for AC joint disruptions are (1) AC joint fixation with pins, screws, suture wires, plates, and hook plates, (2) coracoacromial (CA) ligament transfer, (3) C interval fixation, and (4) ligament reconstruction. CC interval fixation has been described with screw fixation, suture loop fixation, end button fixation (flip buttons), and suture anchors. Our study reviewed 11 patients (8 males and 3 females) with a complete CC ligament disruption who were each treated with two #5 Ethibond sutures placed through drill holes in the clavicle and looped around the coracoid process. This technique offered good functional outcomes and no loss of reduction at a minimum follow up of 10 months (average, 11.5 months). At 12 months after surgery, mean constant murley score is 83.5.

Conclusion: Techniques that anatomically restore the AC joint and coracoclavicular ligaments have shown to be superior in biomechanical studies. we conclude that high grade acromioclavicular joint injury require surgical fixation for better functional outcome.

Keywords: Operative, outcome, acromioclavicular, reconstruction, absorbable

Introduction

- Approximately 12% of all acute shoulder injuries affect the acromioclavicular joint. particularly in young and active men, even higher incidences can be found¹.
- Participation in high impact sports, such as soccer, American football, rugby, skiing, snowboarding, RTA leads to this injury of shoulder girdle owing to direct blow to shoulder with arm adducted.
- Grade I–II injuries are treated conservatively, without surgery, leading to satisfactory results and a return to sporting activity inmost cases^[2].
- The treatment of grade III injuries is controversial. However, surgical treatment is recommended for high-grade lesions IV–VI^[3].

- Despite their clinical impact, there is still no consensus for the surgical treatment of Rockwood high-grade lesions [4, 5].
- From a biomechanical point of view, the importance of the acromioclavicular and coracoclavicular ligaments for maintaining the vertical and horizontal stability of the acromioclavicular joint has been shown [6].
- There are many techniques that can be applied to the repair of the AC and CC ligaments in the literature [7, 8]. It is currently popular to perform these repairs in an anatomic way [5, 9].
- To replace CC ligaments, some authors advocate using tendons (autograft or allograft) [10], while others perform repairs with synthetic devices [11, 12] which allow for the reduction of the AC joint, with the expectation that these devices might act as scaffolding while the injured ligaments heal.
- Appreciation of anatomical structures that provide the acromioclavicular joints stability is vital for successful and sustainable treatment.
- There are 2 ligamentous main structures that stabilize the AC joint in vertical and horizontal directions. The coracoclavicular ligament primarily prevent lateral clavicle from dislocating superiorly, whereas the AC ligaments mainly contribute to horizontal stability of the AC joint.

- The native joint allows motion of lateral clavicle of upto 4-6mm superiorly and rotation with moving up the arm of upto almost 10 degree [13].
- The anteromedially located conoid and posterolateral trapezoid ligament build the CC ligament complex, spanning from the clavicle to the knuckle of coracoids process.
- The superior and posterior portions of the AC ligaments mainly stabilize posterior translation [14].

Materials and Methods

11 patients (8 males and 3 females) who had high grade acromioclavicular joint injury were operated from July 2019 to January 2020. All patients were assessed clinically, radiologically and classified according to rockwood classification. Patients were selected on basis of inclusion and exclusion criteria.

Inclusion criteria

1. Type 3 to 6 grade injury
2. Closed type

Exclusion criteria

1. Type 1 and 2 grade injury
2. Open type

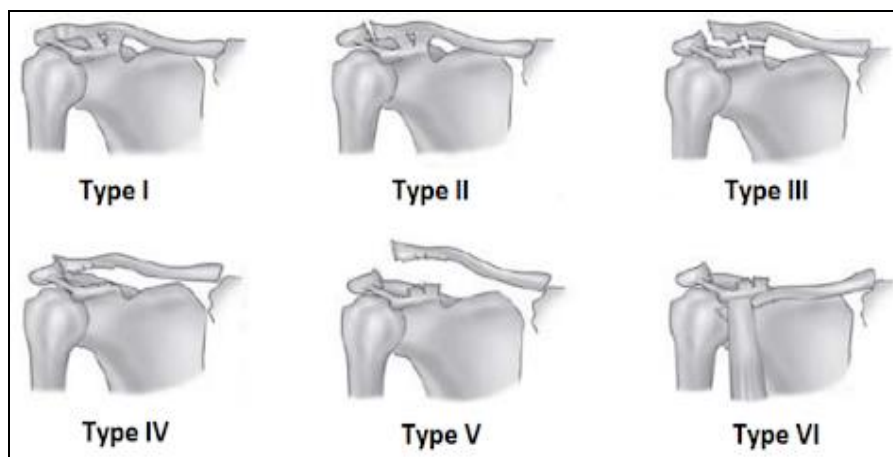


Fig 1: Rockwood Classification

Rockwood classification

❖ Operative procedure

- Coracoclavicular ligaments reconstruction was done under general anaesthesia and beach chair position was given to the patient.
- Vertical incision was given, centered on clavicle approximately 3.5cm medial to AC joint in curvilinear fashion starting from posterior to clavicle to just medial to coracoids process.
- The deltotrapezial fascia is then elevated from the distal clavicle as full-thickness flaps. The fascia was incised in line with the natural demarcation between the trapezius insertion to the posterior aspect of the clavicle and the deltoid origin on the anterior clavicle. Dissection of the fascia was extended far enough medially to expose the conoid ligament insertion, approximately 46 mm \pm 5 mm from the distal end of the clavicle.
- 2 tunnels were prepared, 1 tunnel is placed 45mm medial to distal end of clavicle and posterior to midline of clavicle in coronal plane and 2nd tunnel is placed 1.5cms lateral to 1st tunnel and just anterior to midline of

clavicle.

- Repair of coracoclavicular ligament was done using no 5 ethibond.
- 2 strands of no 5 ethibond suture were passed under knuckle of coracoid process using curved aneurysmal needle as suture passer.
- It was then passed through drill hole in clavicle in figure of eight manner then while keeping AC joint in reduced position, the two ends of no 5 ethibond suture were tied securely to each other, forming knot over distal end of clavicle and reduction maintained with kwire. soft tissue and skin closure done.

Post-operative rehabilitation

Post operatively arm sling was given for 6 weeks. Passive range of motion started with pendulum exercise, towel slides, internal and external rotation, scapula protraction, retraction followed by active range of motion wall slides with trunk, bilateral and unilateral pull with trunk rotations, deltotrapezial complex work. patient returned to his routine work after six month.



Fig 2: Preoperative and intraoperative

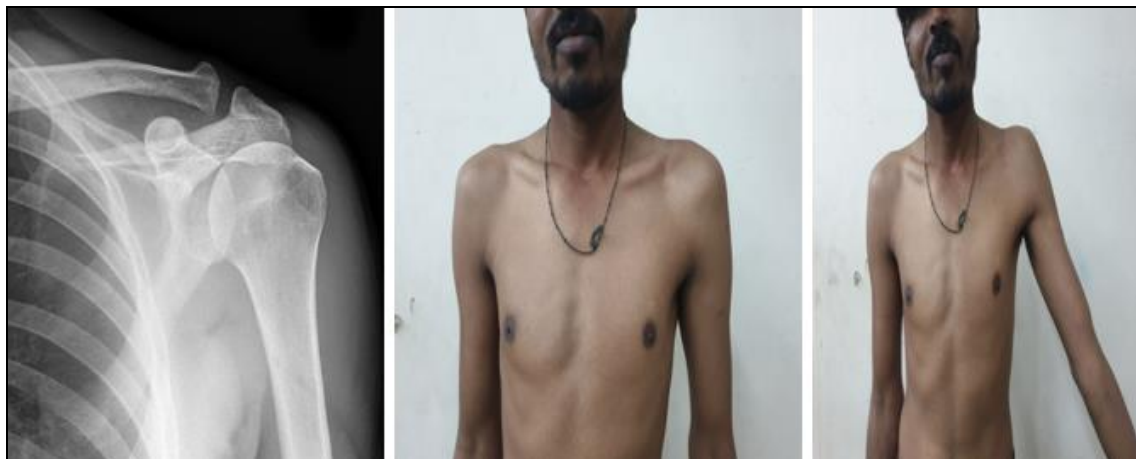




Fig 3: Post-operative shoulder X-Ray and patient follow up at end of one year

Results

In this study 11 patients were included (8 males and 3 females). The age of patients ranged from 23 to 35 years with average age of 29 years. 63% injuries involved dominant side. All the patients were followed up clinically and

radiologically. The mean constant score increased from 51.09 preoperatively to 83.81 postoperatively at followup. All the patients had resumed their activity by 6 months postoperatively. No loss of reduction and no complication was observed at followup.

Table 1: Shows in 11 patients were included (8 males and 3 females).

No	Age	Sex	Mechanism of injury	side	Constant murley score		Visual analog scale	Appearance	Complications
					Pre-op	follow-up			
1	25	M	RTA	R	44	80	8	Satisfactory	NIL
2	28	M	RTA	R	52	85	9	Satisfactory	NIL
3	35	M	RTA	L	60	90	8	Satisfactory	NIL
4	30	M	Domestic Fall	L	36	80	7	Satisfactory	NIL
5	32	M	Assault	R	58	84	9	Satisfactory	NIL
6	27	M	RTA	L	60	90	9	Satisfactory	NIL
7	26	F	RTA	R	62	86	8	Satisfactory	NIL
8	25	M	RTA	L	50	82	8	Satisfactory	NIL
9	30	F	Domestic Fall	L	46	85	9	Satisfactory	NIL
10	31	F	RTA	R	44	80	9	Satisfactory	NIL
11	28	M	RTA	R	50	80	8	Satisfactory	NIL
Ho: Suppose there is no significant difference between pre-op Constant–Murley Score and post-op Constant–Murley Score									
t-Test: Paired Two Sample for Means									

Table 1: Cont....

	Pre-op	Post-Op
Mean	51.09090909	83.81818182
Variance	68.29090909	14.56363636
Observations	11	11
Pearson Correlation	0.786961709	
Hypothesized Mean Difference	0	
df	10	
t Stat	-18.83294462	
P(T<=t) one-tail	1.93E-09	
t Critical one-tail	1.812461123	
P(T<=t) two-tail	3.86E-09	
t Critical two-tail	2.228138852	
Here, p-value = $0 < 0.05$ (level of significance) implies that we fail to accept null hypothesis H_0 .		
i.e. There is significant difference between pre-op Constant-Murley Score and post-op Constant-Murley Score		

Discussion

Currently, the 4 main surgical options for AC joint disruptions are (1) AC jointfixation with pins, screws, suture wires, plates, and hookplates, (2) coracoacromial (CA) ligament transfer, (3) CC interval fixation, and (4) ligament reconstruction. CC interval fixation has been described with screw fixation, suture loop fixation, endobutton fixation (flip buttons), and suture anchors. These techniques transfer the combined forces normally exposed to the AC joint complex and CC ligaments to fixation points on the clavicle and coracoid process.

Our study reviewed 11 patients (8 males and 3 females) with a complete CC ligament disruption who were each treated with two #5 Ethibond sutures placed through drill holes in the clavicle and looped around the coracoid process. This technique offered good functional outcomes and no loss of reduction at a minimum follow up of 10 months (average, 11.5 months). At 12 months after surgery, mean constant murley score is 83.5.

Nonoperative and surgical treatment of AC joint injuries both pose a risk of persistent pain, incomplete return of function, distal clavicle osteolysis, late-onset AC joint arthrosis, and recurrent AC joint instability. Because the AC joint is the prime suspensory joint of the upper extremity and is subject to extremely high-force, repetitive loads, reconstructive techniques that place a rigid AC joint fixation are subject to complications secondary to the construct stiffness they create. Pins placed in the AC joint have migrated into the spinal canal, lung, and subclavian artery. Loop fixation techniques with Mersilene tapes (Ethicon) or other nonabsorbable suture can be complicated by erosion through the clavicle or coracoid process. Other complications associated with the surgical treatment of AC joint injuries include infection, foreign body reactions, and CC ossification. We didn't encountered any above mentioned complication in our study

Conclusion

AC joint injuries are common. especially in contacts sports such as football, hockey and rugby. Type 1 and type 2 AC joint injuries can be expected to have good outcomes with non operative treatment type 3 injuries should also be treated non operatively, except that surgical tretment may be consider when these injuries involve the dominant shoulder of over head atheletes or heavy laborers type 4, type 5, type 6 injuries are less common and best treated surgically. Techniques that anatomically restore the AC joint and coracoclavicular ligaments have shown to be superior in biomechanical studies.we conclude that high grade acromioclavicular joint injury require surgical fixation for better functional outcome.

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