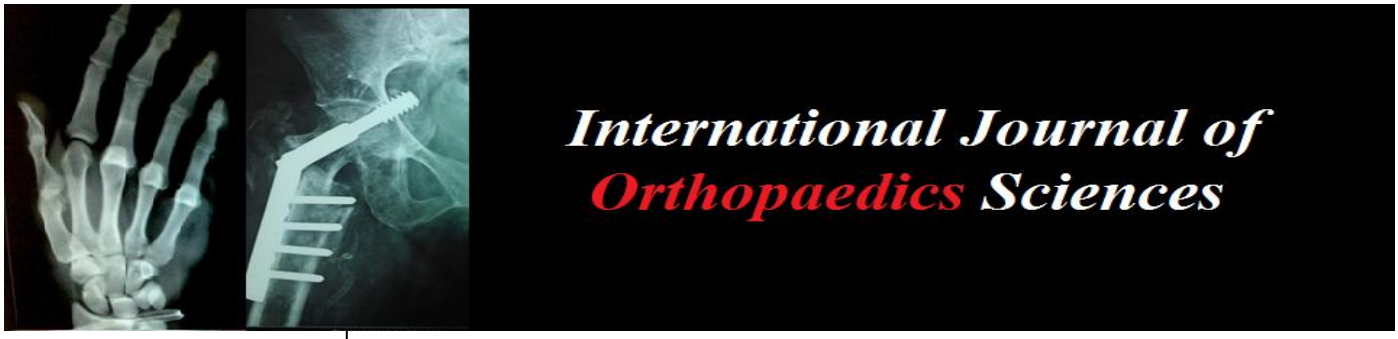

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Functional and radiological outcomes of acromioclavicular joint reconstruction in type iii disruption without allograft with synthetic materials

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Abstract
Introduction: Effectiveness of surgery for complete Acromio-clavicular Joint (ACJ) dislocation is controversial. We analyzed the long-term Functional and radiological outcome after in on Acromio-clavicular ligament reconstruction by modified Mazzocca technique for Type 3 dislocations.
Aim: To study the functional and radiological outcomes of acromioclavicular joint reconstruction in type III disruption without allograft with synthetic materials
Method: Retrospective analysis of case records and patient reviewed to assess the long-term functional and radiological outcome by patient satisfaction, UCLA shoulder rating score and coracoclavicular distances.
Results: We had 38 cases of Type 3 Acromio-clavicular dislocations over a period of 5 years. Mean age of the entire group was 42.1 years (26 to 57). Among them, 32 are males and six females. Three patients were lost their follow-up during the post-op rehabilitation period; among them, two were presented with infection, one with shoulder stiffness. Long-term functional and radiological outcomes were regarding UCLA shoulder rating score, patient satisfaction and coracoclavicular distances compared with the uninjured shoulder.
Conclusions: More aggressive management of acromioclavicular dislocation needed to avoid poor results with chronic injuries, and we have moved toward without graft and earlier surgical intervention. We recommend modified Mazzocca technique used in the management of Grade 3 Acromio-clavicular joint dislocation for the following reasons (A). Better short-term functional and radiological outcome and low risk of complications (B). No need graft harvesting surgery and decreased donor site morbidity.

Keywords: Acromioclavicular, dislocation, reconstruction, distal clavicle resection, outcomes

Introduction
Acromioclavicular (AC) joint disruption typically seen in younger athletic patients which is a relatively Un-common injury. Initially, Tossy *et al*. and Allman established the classification of this injury as type I, II, and III for non-displaced, slightly displaced, and up to 100% displacement of the clavicle in comparison to the acromion [1, 2]. Further classified by Rockwood *et al*. for posterior dislocation, cephalad translation, and infra-coracoid dislocation types IV, V, and VI, respectively [3]. Availability of various techniques and variable results in the literature makes the treatment selection difficult. Types 1 and 2 are incomplete injuries and are treated nonoperatively. Types 3 to 6 are complete injuries. Majority of the orthopedic surgeons will accept for surgical treatment of types 4–6 ACJ dislocation [2]. As for type 3 AC dislocation both early surgical treatment and nonsurgical treatment initially with late reconstruction if necessary have gained support. However, a satisfactory surgical technique has not been developed yet [3, 4]. Mazzocca *et al*. performed a bio-mechanic cadaver study comparing an anatomic coracoclavicular ligament reconstruction using a semi-tendinosis graft to a modified Weaver-Dunn procedure and an arthroscopic technique using non-absorbable suture material. Specimens were tested with a directionally applied force (anterior, posterior, and superior) as well as cyclic loading and load failure to simulate physiologic states at the AC joint. These were compared to the intact ligamentous state. Results showed the anatomical coracoclavicular ligament reconstruction had significantly less anterior and posterior translation when compared to the other forms of reconstruction.

Superior displacement during cyclic loading was equal among the groups. They concluded that anatomic ligamentous reconstruction more closely approximated the intact state, thus providing more stability than the other two forms of reconstruction. A similar study by Gutter *et al*. also showed superior bio-mechanic results of anatomic ligament reconstruction when compared to a modified Weaver-Dunn technique when specimens were loaded to failure in the coronal plane. A significant portion of the literature supporting nonoperative management of grade III injuries involves older surgical techniques such as K-wire and Bosworth screw fixation [4-8]. Newer techniques involving suture buttons and suture anchors have been introduced recently and may represent an improvement in technique.[9] At least two prospective randomized trials comparing the surgical and nonoperative treatment of severe AC joint injuries recommended surgical treatment for injuries with greater than 2 cm of displacement.[4,7] These studies demonstrated superior outcomes for high-grade injuries treated surgically. Additional controversy exists as to the best surgical technique among over 70 different described procedures [4, 9–16].

Aim

To study the functional and radiological outcomes of acromioclavicular joint reconstruction in type III disruption without allograft with synthetic materials

Materials and methods

Retrospective study of 38 patients with Type 3 acromioclavicular Joint dislocation, admitted for stabilization procedure over a period of 5 years at our hospital, was done. All the patients had Type 3 acromioclavicular Joint dislocations and had in various types of jobs ranging from office work to heavy duty manual work occupational or recreational activities. All the patients were given both operative and nonoperative options and all of them preferred operative treatment. The main exclusion criterion was delayed presentation of more than 6 weeks after the injury. All cases had reconstruction of both ligaments with Mersilene tape augmented with fiber wires and resection of lateral end of clavicle and long-term functional outcome was assessed with UCLA shoulder rating Score. At the time of review in terms of strength of the shoulder, appearance of shoulder and whether the patient was able to return to the pre-injury level of activity or not and satisfaction of the patient also recorded.

Modification of Mazzocca technique was used in the study. (Figure 1) Anterior approach to expose the acromio-clavicular Joint, the lateral end of the clavicle, and the coracoid process was performed. A 2.5 to 3cm incision is made over the coracoid process. The base of the coracoid process exposed medially as well as laterally. Drill hole made on the superior surface of the clavicle 35mm and 45mm from the lateral end of the clavicle in between 10mm gap antero-lateral and postero-medial respectively. Mersilene tape and fiber wires are hooked around the coracoid process at its base than both materials crossed above the coracoid process. Mersilene tape and fiber wires are passed through the drilled holes from inferior surface of the clavicle to superior surface. The lateral one centimetre of the clavicle was removed in an oblique fashion so that the inferior part of the oblique osteotomy overlies the coracoid process. The clavicle is held in an anatomic position relative to the coracoid. The proper length is selected to maintain the reduction and knotted superiorly.

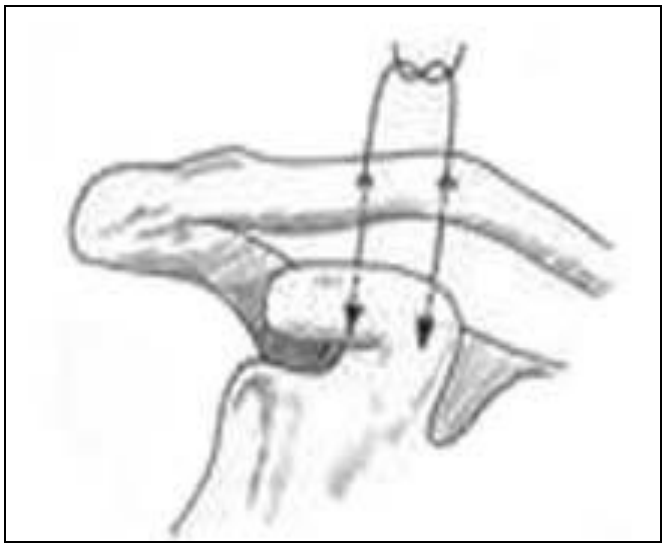

Fig 1: Mazzocca technique

Results

38 cases of Type 3 ACJ Dislocation had surgical stabilization over a period of 2.8 years. Mean age of the entire group was 42.1 years (26 to 57). Among them 32 are males and 6 females. All patients were employed in various types of jobs ranging from office work to heavy duty manual works. Mechanism of injury was fall in most of the cases. Dominant (right) shoulder was injured in 28 cases and non-dominant (left) in 10. All of them discharged between fifth to seventh post-operative days. Mean UCLA shoulder rating scale was 31.55 (range from 27- 35) for the injured shoulder Three patients were lost their follow-up in the post-op rehabilitation period; among them two were presented with infection, one with shoulder stiffness. Coracoclavicular distance was measured from superior surface of the coracoid to inferior surface of the clavicle. P value is 0.310. (Table 1) Range of Movements: Range of movements was well maintained in all patients except one patient.

Table 1: Fracture side and normal side by coracoclavicular distance.

Coracoclavicular distance	Fracture side	Normal side
Mean	0.861	0.827
SD	0.10	0.10
p value	0.310	

Fig 2: Pre operative

Fig 3: Post operative

Fig 4: Pre operative

Fig 5: Post operative

Discussion

This study is the first study of our knowledge to show improved surgical outcomes fiber wires with Mersilene tape augmentation fixation techniques and to decrease donor site morbidity. During follow-up improvement in grade of acromioclavicular separation and lower revision rate, as well as the overall percentage of procedures that resulted in type I acromion-clavicular joint appearance at final radiograph. Our study group restored to a near normal function of the shoulder and normal anatomic alignment as all other historic surgeries without donor site morbidity.

A superior clinical outcome considers when a surgical procedure gives better restoration of acromioclavicular joint anatomy without donor site morbidity. However, in our retrospective review, we did not observe any statistically significant differences in our measurement of clinical function or pain. There was a trend toward improvement with suture button repairs, but it failed to achieve statistical significance. The clinical outcome measure may not have been a sensitive enough measure when applied retrospectively to detect differences in clinical outcome.

Despite a lack of consensus in the management of these acromion-clavicular joint injuries, most providers support reconstruction in the most severe acromioclavicular injuries. Although multiple techniques exist, there is a trend toward a greater use of suture button techniques [17]. Among those surgeons using suture buttons, there is debate as to the best means of employing this implant for acromioclavicular joint repair and reconstruction. This debate led to the evaluation of our technique. By our techniques; we are reducing the cost-effectiveness and donor site morbidity which will optimal procedure for developing nations. Two materials increase the effective strength of the construct, better allowing it to resist superior translation with loading as well as better mimic the native anatomy of the coracoclavicular ligaments. In our technique location of placement of the drill holes represent the trapezoid and conoid divisions of the coracoclavicular ligaments [18-22].

Our surgical technique also showed a beneficial effect in the management of chronic acromion-clavicular joint injuries. Historic surgeries included multiple augments of allograft tissue to assist in maintaining the reduction until allograft tissue incorporated into the native coracoclavicular ligaments. Another finding in our study was the improvement in outcomes noted for surgeries performed with distal clavicle resections. In all thirty-eight cases simultaneously performed distal clavicle resection which will prevent acromioclavicular joint arthropathy in future. Procedures not utilizing a distal clavicle resection resulted in a morbidity of shoulder function. There are better results in clinical outcome or pain outcome grading was observed with distal clavicle resection [23, 24].

Limitations

Limitations of this study include the retrospective nature of the review. Various selection biases such as surgeon experience, operation provided, and surgical indications are included in our retrospective study. There are also inconsistencies in the clinical data available, making clinical outcome measures difficult to discern. Another significant limitation of this study was difficulty in identifying chronicity of injury. The charting was nonspecific for dating injuries, and therefore it is unavailable for analysis.

We, therefore, combined our results for acute and chronic injury. We recognized that this represents another selection bias but attempted to take this into account in our analysis of the data. Based on the practice characteristics of the surgeons at our institution, all of the surgeries were acute because all surgeons at this practice augment repairs. We assume that chronic injuries are more difficult to maintain in a reduced position. This has led to a change in philosophy within our group toward more aggressive early treatment to prevent chronic deformity, which is more difficult to manage. The analysis of chronic suture surgeries versus other historic surgeries was the attempt to eliminate the bias from chronicity of injury.

Conclusion

Our study highlights the experience of our institution with the management of acromion-clavicular injuries. Our institution has largely abandoned allograft and included distal clavicle resection in conjunction with the acromion-clavicular reconstruction with Mersilene tape and fiber wires to prevent acromion-clavicular joint arthropathy. More aggressive management of acromioclavicular dislocation needed to avoid poor results with chronic injuries, and we have moved toward without graft and earlier surgical intervention. We believe that these results are important and relatively unrepresented in the orthopedic literature.

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