VOLUME - 12, ISSUE - 04, APRIL - 2023 • PRINT ISSN No. 2277 - 8160 • DOI : 10.36106/gjra

Original Research Paper

Orthopaedics

ANCHOR SUTURE TECHNIQUE FOR ACROMIOCLAVICULAR JOINT DISRUPTION

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ABSTRACT

Background- Acromioclavicular (AC) joint disruption are common injuries and compose a sizeable portion of shoulder injuries. **Methods-** The clinical and radiographic outcomes of 29 consecutive patients (20 men and 09 women) who underwent anatomic reduction for acute ACJ disruption using two suture anchors for CC ligament reconstruction and two strands of non-absorbable stitches for ACJ fixation. Two 3.5 mm suture anchors with double-loaded sutures were separately inserted into the anterolateral and posteromedial portions of the coracoid process. The suture strands were passed through the hole created in the clavicle using 2.0 mm drill and tied over the clavicle. Additional ACJ augmentation using two strands of non-absorbable heavy sutures was performed in all patients. At 3, 6, and 12 months follow-up , the scores on the visual analog scale (VAS), the American Shoulder and Elbow Surgeons (ASES) score, Constant–Murley score, and simple shoulder test (SST) questionnaires were used to provide a final evaluation of shoulder function. Comparison between baseline and treatment results was performed. Radiographic analysis included vertical displacement and horizontal shift. **Results:** The mean preoperative, 3-month, 6-month, and 12-month follow-up evaluation ASES scores were 43.25±5.23, 75.69±6.29, 92.02±5.09, 93.25±7.29 respectively. The ASES score at 12 months postoperative was 48 higher than the preoperative ASES score ($P < 0.01$). There was no significant difference in ASES score between the 6- and 12- month follow-up evaluations ($P > 0.05$). The mean preoperative, 3-month, 6-month, and 12-month postoperative SST were 2.08±0.68, 8.12±1.21, 10.08±2.01respectively. The SST at 12 months postoperative was 10 higher than the preoperative SST ($P < 0.01$) between the baseline and 12-month follow-up data. No significant difference between the 6- and 12-month follow-up evaluations could be found ($P > 0.05$). The mean preoperative, 3-month, 6-month, and 12-month postoperative CMS were 30.18±4.26, 70.25±5.26, 88.27±3.28, respectively. The CMS at 12 months postoperative was 60 higher than the preoperative CMS ($P < 0.01$) between the baseline and 12-month follow-up data. No significant difference between the 6- and 12-month follow-up evaluations could be found ($P > 0.05$). **Conclusions:** CC ligament reconstruction using two suture anchors and ACJ augmentation using two strands of nonabsorbable heavy sutures on high-grade AC dislocation is a reliable technique for restoring stability to the ACJ and can obtain good to excellent clinical results.

KEYWORDS : Acromioclavicular (AC), CMS, VAS

INTRODUCTION

Acromioclavicular (AC) joint dislocations are common injuries and compose a sizeable portion of shoulder injuries.[1] These conditions account for 9% to 12% of shoulder girdle injuries[2] and are more frequent in young adults and athletes, often resulting from a direct fall on to the superior aspect of the shoulder when the arm is adducted[3],and five times more common in men than in women. Although the incidence of high-grade ACJ injuries requiring surgery is low, indications for the conservative versus surgical treatment of type III and V injuries produce controversy.[3-6] This disagreement has encouraged the development of multiple surgical techniques and may reflect a general dissatisfaction with treatment options and outcomes.[7]

In 1996, in an effort to diminish the likelihood of such complications and to simplify this common procedure, the authors began using a specific fixation technique that includes suture anchors moored in the base of the coracoid process. Advantages include a smaller incision and dissection limited to the region above the coracoid. As no instruments or fixation materials are passed underneath the coracoid, risk for neurovascular injury is minimized. In addition, no hardware transfixes the AC joint or requires removal at a later time.[8]

MATERIAL AND METHODS

Type of study – Hospital based prospective study

Sample size- 29 patients

Inclusion Criteria Were

(i) All type IV and V dislocations and unstable type IIIB dislocations;
(ii) acute (<3 weeks) injuries;
(iii) Two suture anchors for CC repair and nonabsorbable heavy stitches forAC augmentation;
(iv) follow-up of at least 12 months.

The Exclusion Criteria Were:

(i) Hook plate fixation;
(ii) Concomitant coracoid fractures;
(iii) Chronic separations

All the 29 patients were prospectively assessed clinically and radiographically preoperatively and at 3, 6, and 12 months post operatively. Clinical and radiographic data from the 12-month follow-up were statistically compared with the baseline. The work was approved by the ethical committees in our institution, and patients gave their informed consent.

Operative Technique

Anesthesia and Position-The procedure was performed with the patient in beach chair position and under brachial plexus block or general anesthesia.

Approach and Exposure

An incision was made starting at the posterior edge of the

clavicle, 2 cm medial to the ACJ and extending inferiorly toward the coracoid process along the Langer line. Dissection was performed to the delto-trapezial fascia with electrocautery. The fascia was elevated off the clavicle bycreating full-thickness flaps. The intra-articular disc was removed, all soft tissues preventing proper joint reduction were resected, and a trial reduction was performed. Effort was made not to excise nor damage the distal clavicle.

Vertical Stability Repair

Through dissection, the base of the coracoid process was exposed. Two 3.5 or 5.0 mm (for stronger patients) suture anchors (Twinfix, Smith & Nephew, Memphis, Tennessee,US) with double-loaded sutures were separately inserted into the anterolateral and posteromedial portions of the coracoid process and matched to the conoid and trapezoid ligament anatomic insertion. The clavicle was preoperatively templated to place the conoid tunnel at 20% to 25% of the clavicular length from the distal clavicle, and the trapezoid tunnel was placed 1.5 cm to 2 cm lateral to this position(near the anatomic insertion at 17% of clavicular length). Two holes, at least 1 cm apart, were created in theclavicle with a 2.0 mm drill for conoid and trapezoid ligament insertion separately.

A special passer was used to assist in passing the loaded sutures of anchors quickly. The sutures were left for later tightening.

Horizontal Stability Reconstruction

To horizontally stabilize the ACJ, we created two tunnels by using a special 2 mm-diameter awl. The tunnel started from the acromion, passed through the ACJ, and obliquely exited the superior surface of distal clavicle 1 cm from ACJ. Two number-2 Ethibond sutures were then pulled through the holes of the acromion and distal clavicle separately. The dislocated ACJ was reduced under direct vision with shoulder abduction by manually pressing down the distal end of the clavicle. After reduction of the ACJ, the sutures on the superior sur-face of clavicle for CC ligament repair were tightened and tied, followed by tightening of the sutures on the distal clavicle for ACJ augmentation. After repairing the AC ligament and capsule, the stability was then assessed by passively mov-ing the shoulder. The deltotrapezial fascia was carefully repaired, and a routine wound closure was performed

Postoperative Management

Postoperative rehabilitation included wearing a strict sling for 6 weeks. Passive shoulder motion was begun at 3 weeks, and exercises against resistance were subsequently added at 6 to 8 weeks postoperatively. Motion was gradually increased after cessation of sling wear with a goal of full motion at3 months. Strengthening started at this point, and patientswere allowed to return to contact sports at 6 months

Follow-up Analysis

All patients were follow up till 12 months. At the 3-, 6-, and 12-month and the latest follow-up, radiographic analysis and visual analog scale(VAS), American Shoulder and Elbow Surgeons (ASES)score, Constant–Murley score, and simple shoulder test(SST) questionnaires were utilized for the final evaluation of shoulder function

Radiological Assessment

Antero-posterior radiographs of both ACJs were produced for each patient. Axillary radiographs were obtained for theinjured side only. Maintenance of vertical reduction of the ACJ was defined as follows:

(i) A maintained reduction, thatis, no side-to-side difference on the anteroposterior radio-graphs; (ii) a partial loss of reduction, that is, a side-to-sidedifference of less than the width of the clavicle; (iii) completeloss of reduction, that is, evidence of a side-to-side differencein excess of the clavicle width.

(ii) Horizontal stability wasassessed by axillary view and three-dimensional computedtomography (3-D-CT).

The anterior tip of acromion and anterolateral edge of the distal clavicle were in line or at dis-placement less than 2 mm with the ACJ in anatomical position, indicating no subluxation nor dislocation in terms of horizontal instability. Anterior–posterior displacement exceeding 2 mm was defined as horizontal instability.

Data Analysis

Descriptive statistics, including the mean and standard deviation (SD) for continuous variables, and the frequency and proportion of categorical variables were calculated. Statistic alanalysis was performed using SPSS for Windows (version 22;SPSS Inc., Chicago, Illinois, US). Comparisons between more than two groups were conducted using the Kruskal–Wallistest. A P value <0.05 was considered significant.

RESULTS

Table 1. Socio-Demographic Profile

Mean age	41.23±9.32 years
Male : Female	19:10
Road traffic accident	20(68.97%)

Table 2. Operative

Mean duration of surgery	71.23±14.23 mint
Mean blood loss	64.32±8.36 ml
Average post-operative follow-up	28.02±5.29 months

Table 3. Outcome

The functional score	Pre-operative	Post-operative 3rd month	Post-operative 6th month	Post-operative 12th month	p-value
VAS	6.23± 1.23	4.02± 1.01	2.02± 0.98	0.85± 0.61	0.001
CMS	30.18± 4.26	70.25± 5.26	88.27± 3.28	92.38± 2.89	0.001
SST	2.08± 0.68	8.12± 1.21	10.08± 2.01	12.05± 3.02	0.001
ASES	43.25± 5.23	75.69± 6.29	92.02± 5.09	93.25± 7.29	0.001

ASES, American Shoulder and Elbow Surgeons; CS, Constant and Murley score; SST, simple shoulder test; VAS, visual analog scaleThe mean preoperative, 3-month, 6-month, and 12-month follow-up evaluation ASES scores were 43.25±5.23, 75.69±6.29, 92.02±5.09, 93.25±7.29 respectively. The ASES score at 12 months postoperative was 48 higher than the preoperative ASES score ($P < 0.01$). There was no significant difference in ASES score between the 6- and 12-month follow-up evaluations ($P > 0.05$). The mean preoperative, 3-month, 6-month, and 12-month postoperative SST were 2.08±0.68, 8.12±1.21, 10.08±2.01respectively. The SST at 12 months postoperative was 10 higher than the preoperative SST ($P < 0.01$) between the baseline and 12-month follow-up data. No significant difference between the 6- and 12-month follow-up evaluations could be found ($P > 0.05$). The mean preoperative, 3-month, 6-month, and 12-month postoperative CMS were 30.18±4.26, 70.25±5.26, 88.27±3.28, respectively. The CMS at 12 months postoperative was 60 higher than the preoperative CMS ($P < 0.01$) between the baseline and 12-month follow-up data. No significant difference between the 6- and 12-month follow-up evaluations could be found ($P > 0.05$).

DISCUSSION

No consensus has been reached regarding the treatment of high-grade AC dislocation despite the prevalence of this injury.[3] The choice of an adequate surgical procedure is based on various factors, such as the surgeon's preference, the patient's activity level, and biomechanical properties of the

surrounding ligaments.[10] More than 150 variations have been described to treat symptomatic ACJ separations; however, the superiority of a single technique has not been defined up to this point. Regardless of the construct used, reduction must be maintained long enough for the biological healing process to occur.[12]

Anatomic reconstruction of the CC and AC ligaments using tendon grafts and endobutton CC fixation in acute ACJ dislocation have rapidly gained popularity in the past few decades. [13] Clavicle and/or coracoid fractures resulting from bone tunnels, which are usually 6 mm in diameter, are the main reasons that restrict these techniques. Several authors recommended the use of 3 mm bone tunnels to avoid the use of large bone tunnels to reduce either clavicle or coracoid fractures.[14]

CONCLUSION

Currently, no single surgical technique has demonstrated superior results over other forms of fixation. The authors believe that the two-suture anchor fixation method for CC ligament and suture augmentation for ACJ demonstrates a reliable alternative for the surgical treatment of acute AC dislocation. This technique restores the stable ACJ both vertically and horizontally and provides sufficient strength to hold the distal clavicle to the coracoid process for CC and AC ligament healing. Nevertheless, other factors require attention during the surgical procedure.

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