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Original Research Article

FUNCTIONAL OUTCOMES OF ACROMIOCLAVICULAR JOINT DISRUPTIONS MANAGED WITH HOOK PLATE FIXATION: A PROSPECTIVE CLINICAL STUDY

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ABSTRACT

Background: Acromioclavicular (AC) joint dislocations are common shoulder injuries often resulting in significant pain and functional limitations. Surgical intervention, including hook plate fixation, is a widely used treatment option. The objective is to evaluate the functional outcomes of patients with AC joint disruptions managed using hook plate fixation.

Materials and Methods: Thirty patients with acute Type III to Type VI acromioclavicular joint dislocations according to Rockwood classification were enrolled. All patients underwent open reduction and internal fixation using hook plates and screws. Patients were followed for 2 years at regular intervals. Post-surgery, the affected arm's CONSTANT and UCLA scores were assessed and compared with the normal arm.

Results: All patients demonstrated significant improvement in both CONSTANT and UCLA scores. At final follow-up, mean CONSTANT and UCLA scores were 93.4 and 31.20 respectively. The majority of patients achieved satisfactory pain relief and restoration of shoulder function. Complications including superficial infection, osteolysis, and osteoarthritis of the acromioclavicular joint were noted in few cases.

Conclusion: Hook plate fixation is an effective method for managing AC joint disruptions, offering significant improvements in functional outcomes. When combined with systematic postoperative rehabilitation programs, this method demonstrates excellent patient satisfaction and consistent outcomes.

Keywords: Acromioclavicular joint, hook plate, shoulder dislocation, functional outcome, Rockwood classification.

INTRODUCTION

Acromioclavicular joint dislocations are a common type of injury that frequently results from trauma directed toward the shoulder joint. The acromioclavicular joint not only participates in shoulder-related activities but also serves an important structural role in connecting the shoulder to the trunk. The AC joint plays a critical role in maintaining the structural integrity and kinematics of the shoulder girdle, facilitating a wide range of upper limb movements.[1] Disruptions to this joint, particularly in higher-grade injuries, can lead to pain, instability, cosmetic deformity, and impaired shoulder function.[2]

Acromioclavicular joint disruption is often accompanied by pain, discomfort, and shoulder dysfunction. The understanding of AC joint biomechanics continues to evolve, and treatment methods, both conservative and surgical, continue to be refined. AC joint injuries are commonly graded using the Rockwood classification system, ranging from Type I to Type VI. Higher-grade injuries (Type III and above) frequently necessitate surgical intervention to restore joint stability and function, while lower-grade injuries (Types I and II) are usually managed conservatively.[3–5]

Among various surgical techniques, hook plate fixation has gained prominence due to its ability to provide stable fixation and allow for early mobilization.[6] The hook plate is designed to bridge the damaged AC joint, providing support to the distal clavicle while preserving the joint's anatomical relationship. Despite its effectiveness, hook plate fixation has drawbacks, including the possibility of implant-related discomfort, subacromial

impingement and the need for subsequent implant removal.[7] However, many surgeons still favor this method for treating complex AC joint disruptions.[8,9] Against this background, our study aims to evaluate the functional outcomes of patients with AC joint disruptions managed using hook plate fixation.

MATERIALS AND METHODS

Study Design and Participants

This prospective observational study was conducted at a tertiary care medical institute in Chennai, Tamilnadu, from November 2021 to November 2024. The study protocol was approved by the institutional ethics committee and informed consent was obtained from all participants.

Inclusion Criteria

- Acute AC joint dislocation (≤7 days from injury)
- Rockwood Types III-VI classification
- Age 18-50 years
- No previous shoulder pathology

Exclusion Criteria

- Rockwood Types I-II injuries
- Age >50 years
- Chronic dislocations (>7 days)
- Previous ipsilateral shoulder surgery
- Associated fractures (except lateral clavicle avulsion)

Surgical Technique: All procedures were performed under general anesthesia with the patient in a beach-chair position. A standard superior approach was used with a 6-8 cm incision centered over the AC joint. After exposure and debridement of interposed soft tissue, anatomical reduction was achieved and temporarily held with K-wires. A pre-contoured clavicular hook plate was positioned with the hook engaging the acromion undersurface. The plate was secured to the clavicle using 3.5mm cortical screws. Fluoroscopic confirmation of adequate reduction and implant position was obtained before closure.

Post-operative Management: Patients were immobilized in a shoulder sling for 6 weeks. Pendulum exercises were initiated at 2 weeks, with progressive range of motion exercises at 6 weeks. Strengthening exercises commenced at 12 weeks, with return to full activities at 4-6 months based on clinical and radiographic healing.

Outcome Assessment: Functional outcomes were assessed using validated scoring systems:

1. **Constant-Murley Score (CMS):** Composite score (0-100) evaluating pain, activities of daily living, range of motion and strength.
2. **UCLA Shoulder Rating Scale:** Comprehensive assessment (0-35) of pain, function, range of motion and patient satisfaction.

Assessments were performed at 6 weeks, 3 months, 6 months, 1 year, and 2 years post-operatively. Bilateral shoulder evaluation was conducted to establish contralateral normal values.

Statistical Analysis: Data analysis was performed using IBM SPSS. Descriptive statistics included means, standard deviations, and frequencies. Repeated measures ANOVA was used to assess temporal changes in functional scores. Paired t-tests compared affected versus normal shoulders. Significance was set at $p<0.05$.

RESULTS

Demographics and Injury Characteristics

[Table 1] depicts the demographic characteristics of the patients. Among the 30 patients, the majority of participants belonged to the 30-39 years age group (44%). Male patients predominated in our study (76%), and most injuries resulted from road traffic accidents (62%).

Table 1: Demographic characteristics of patients

Variable	No of Patients n = 30 (%)
Age (years)	
20-29	7 (23)
30-39	13 (44)
40-49	10 (33)
Gender	
Male	23 (76)
Female	7 (24)
Mode of injury	
RTA	19 (62)
Slip and fall	5 (16)
Sports injury	6 (21)

Functional Outcomes: Significant improvement was observed in both CMS and UCLA scores throughout the follow-up period [Table 2]. CMS improved from 36.0±8.2 at 6 weeks to 94.0±4.1 at 2 years ($p<0.001$). Similarly, UCLA scores increased from 7.8±2.1 at 6 weeks to 34.1±2.8 at 2 years ($p<0.001$).

Table 2: Average constant & UCLA scores among patients with Acromioclavicular joint dislocation

Follow-up	CMS (Mean±SD)	UCLA Score (Mean±SD)	p-value*
6 weeks	36.0±8.2	7.8±2.1	-
3 months	72.0±9.1	18.7±3.4	<0.001
6 months	88.6±5.8	28.9±2.9	<0.001

1 year	92.0±4.9	31.2±2.7	<0.001
2 years	94.0±4.1	34.1±2.8	<0.001

*Compared to previous time point

At final follow-up, comparison between affected and normal shoulders showed excellent functional recovery [Table 3]. The affected shoulder achieved 96.1% of normal CMS (94.0 vs 97.8, p=0.082) and 94.2% of normal UCLA scores (34.1 vs 36.2, p=0.139).

Table 3: Affected vs Normal Shoulder Comparison at 2 Years

Parameter	Normal Shoulder	Affected Shoulder	Recovery (%)	p-value
CMS	97.8±2.1	94.0±4.1	96.1	0.082
UCLA	36.2±1.8	34.1±2.8	94.2	0.139

Complications: Five patients (16.7%) experienced complications. Superficial wound infection occurred in 2 patients (6.7%), managed successfully with oral antibiotics. Three patients (10.0%) developed AC joint osteolysis with secondary osteoarthritis, confirmed radiographically but without significant functional impairment. No cases of implant failure, subacromial impingement requiring revision, or neurovascular complications were observed.

Patient Satisfaction: At final follow-up, 28 patients (93.3%) expressed satisfaction with their outcome. Two patients with osteolysis reported mild persistent symptoms but remained functionally satisfied.

DISCUSSION

This prospective study demonstrates that hook plate fixation provides excellent functional outcomes for acute AC joint disruptions with acceptable complication rates. Our findings support the continued use of this technique for appropriately selected patients with higher-grade AC joint injuries. The functional scores achieved in our study compare favorably with existing literature and demonstrate superior outcomes in several comparisons. A systematic review and meta-analysis by Arirachakaran A et al. found that the pooled mean score among hook plate patients was 90.35, whereas in our study the postoperative average Constant score in the affected arm was 93.4 and in the normal arm was 97.8.[10] Chang HM et al. conducted a comparative study between hook plate fixation and hook plate plus coracoclavicular tape augmentation groups. In their hook plate fixation group, the final follow-up UCLA score was 31.6 ± 3.9, while our study achieved a superior final follow-up UCLA score of 34.12 at 2 years.[11] Another comparative study by Shen G et al. showed average CMS and UCLA scores at 27 months follow-up after hook plate fixation of 93.7 ± 6.6 and 33.7 ± 1.5, respectively, which closely matches our study results.[12]

Sivanandan et al. reported CMS values of 77.9±7.7, 89.7±4.6, and 93.3±3.2 at 3, 6, and 12 months respectively,[13] closely matching our results of 72.0, 88.6, and 92.0 at corresponding time points. Similarly, Unal et al. found UCLA scores of 25.4, 28.2, and 31.3 at 3, 6, and 12 months,[14] consistent with our findings of 18.7, 28.9, and 31.2.

Functional measures such as the UCLA and Constant scores showed notable improvements in the majority of patients, demonstrating the effectiveness of hook plate fixation in restoring shoulder function and reducing postoperative pain. Within three to six months following surgery, patients achieved nearly complete functional recovery. Physical therapy and early mobilization were crucial in accelerating recovery. The results of this investigation are consistent with earlier studies demonstrating the efficacy of hook plates in treating AC joint disruptions. High patient satisfaction ratings and improved functional outcomes were also documented in studies by Koukakis A et al. and von Heideken J et al.[9,15]

The 16.7% complication rate in our series compares favorably with other hook plate studies. A recent meta-analysis analyzing 474 patients with AC joint disruptions treated with hook plates reported acromial osteolysis as one of the most common complications of hook plate fixation, with the hook plate only group showing 73% higher odds of developing acromial osteolysis compared to those with coracoclavicular augmentation.[16] Importantly, all complications were minor and manageable conservatively. The absence of major complications such as implant failure or neurovascular injury reflects careful patient selection and surgical technique.

Our study demonstrates that functional recovery continues beyond the first year, with meaningful improvements observed between 1 and 2 years postoperatively. This finding emphasizes the importance of long-term follow-up in evaluating treatment outcomes and counseling patients regarding expected recovery trajectories.

The hook plate technique offers several advantages including reliable fixation, technical simplicity, and the ability to address various injury patterns. However, limitations include the need for implant removal in some cases and potential for subacromial impingement. The decision for implant removal should be individualized based on patient symptoms and functional demands.

Several limitations warrant consideration. The relatively small sample size and single-center design may limit generalizability. The study lacks a control group for comparison with alternative treatment methods. Additionally, the 2-year follow-up, while adequate for functional assessment, may not capture long-term complications such as late arthritis development.

CONCLUSION

Hook plate fixation for acute AC joint disruptions results in excellent functional outcomes with high patient satisfaction and acceptable complication rates. The technique provides reliable restoration of shoulder function, with scores approaching normal values by 2 years post-operatively. These findings support the continued use of hook plate fixation as a primary treatment modality for appropriately selected patients with higher-grade AC joint injuries. Further prospective comparative studies with longer follow-up periods are needed to definitively establish the optimal treatment approach for AC joint disruptions and to identify factors predictive of superior outcomes.

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