

Internal Splintage of Acute Acromioclavicular Joint Dislocation Using Polyester Suture: Experience from a Nigerian Orthopaedic Hospital

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Abstract

Background: Various surgical options have been described for acute acromioclavicular joint (ACJ) disruption. Dynamic fixation of these fractures is the most favoured option. However, no single modality of treatment has been adjudged to be the best option so far. **Purpose:** The goal of this study was to present the outcome of internal splintage of acute ACJ disruption using polyester suture without clavicle drilling in our setting. **Patients and Methods:** This prospective study was done at the National Orthopaedic Hospital, Dala, Kano, on those with acute ACJ injuries between January 2016 and June 2021. Forty five patients (36 males and 9 females) had internal splintage of acute ACJ disruption using polyester-5 suture loops around the coracoid process and clavicle without bone drilling. **Results:** The average age of the patients in this study was 31.51 ± 11.43 years, while the age group with highest frequency was 21–30 years, accounting for 17 (37.8%) of all the patients. The mean pre-operative and post-operative disability (QuickDASH) scores were 80.08 ± 10.75 and 3.23 ± 3.58 , respectively. There was a significant difference between pre-operative and post-operative QuickDASH scores with $P < 0.001$. **Conclusion:** Internal splintage of acute ACJ dislocation using polyester-5 suture loop without bone drilling is effective and safe.

Keywords: Acromioclavicular joint, dislocation, dynamic acromioclavicular joint fixation, internal splintage, polyester suture

INTRODUCTION

Background

Acromioclavicular joint (ACJ) injuries account for 5%–9% of injuries affecting the shoulder joint.^[1] Active males especially those involved in athletics, heavy manual workers, military, and paramilitary are commonly affected.^[2,3] The management of these injuries has been largely based on Rockwood classification. The management of ACJ injuries has been a subject of controversy and debate over the years and no consensus has been reached as to the best treatment modality.^[4] Rockwood I and II are usually treated by conservative means, while Rockwood IV to VI injuries are commonly treated by surgical means.^[4-6] However, the treatment for Rockwood III dislocations is still a matter of debate as there is no consensus on the best treatment modality be it conservative or surgical.^[4-6]

There are many surgical options for treating ACJ disruption which include but not limited to static fixation such as use of hook plate, k-wire, screws and dynamic fixations such as the use of tight ropes, sutures and ligament reconstruction using grafts etc.^[7,8] Dynamic fixation is however been favoured recently. These surgical options can be done through open method or arthroscopically assisted.^[7,8]

Purpose

Internal splintage using polyester-5 suture has been a preferred procedure for acute (<3 weeks) ACJ disruption in our hospital for the past 7 years. The purpose of this study therefore was to determine the effectiveness of this technique.

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PATIENTS AND METHODS

A prospective study was carried out on patients with acute ACJ injury at the National Orthopaedic hospital, Dala-Kano, Nigeria between January 2016 and June 2021. Ethical approval for the study was obtained on 23 December 2015 from the Research Ethics Committee of the Hospital (NOHD/RET/ETHIC/60).

Inclusion criteria

All adults within the ages of 18 and 64 years who had acute ACJ dislocation, who consented for and were treated using internal fixation with polyester-5 suture and had complete follow-up data for at least 12 months.

Exclusion criteria

The exclusion criteria were ages <18 and more than 64 years, ACJ dislocation more than 3 weeks, associated clavicular fracture requiring fixation, those with fractured ipsilateral upper limb bone/bones, those with multiple comorbidities, and patients who refused giving consenting.

All those that consented for the study and met other inclusion criteria were recruited. History, clinical examination as well as X-ray of the affected joint were taken. Following diagnosis, all patient were counselled for the intended procedure, and consent was obtained.

The surgery was performed using polyester-5 suture (Ethibond Excel, Johnson & Johnson Medical Devices Companies) loops around the coracoid process and clavicle without drilling bone. Patients were followed up for a minimum of 12 months.

The functional outcome was assessed pre-operatively and post-operatively with QuickDASH scoring system.^[9] The QuickDASH score is a simplified version of the disability, arm, shoulder and hand score outcome measure (DASH).^[9] The DASH outcome score has about thirty parameters that are scored. These parameters include function of the upper limb, pain, weakness, patients' self-esteem, and sleep disturbance. The total score obtained are added up and inserted into a formula that gives the DASH score. In the QuickDash, only 11 parameters are used instead of the thirty items in the DASH score. The sum of the score just like in DASH score is also imputed into a formula to get the score.^[9] X-ray evaluation was done for all patients before surgery, immediately after surgery and at each follow-up visit which are at 6 weeks, 3 months, 6 months and 1 year, respectively [Figure 1].

Surgical technique

All surgeries were performed by two surgeons with the patient in supine position under general anaesthesia with a bump/sandbag under the ipsilateral scapular. General anaesthesia was used for all the cases and a third-generation cephalosporin (ceftriaxone) was given at induction of anaesthesia as prophylaxis. Skin incision was made from about a finger breadth posterior to the ACJ which was extended to the tip of the coracoid process. The incision was deepened down to subcutaneous tissue. A tissue flap of skin and subcutaneous tissues was raised from the anterior

deltoid to the posterior trapezius to allow for adequate soft-tissue envelope for closure. Exposure of the coracoid process was done by splitting the deltoid muscle towards its tip. More dissection was performed medially and laterally in a blunt fashion to aid exposure. In passing the polyester sutures, a suture passer was used to pass two pairs of braided polyester-5 sutures around the base of the coracoid process. One end of each pair was passed behind the clavicle and the other end in front of it. ACJ disruption was reduced under direct vision by the assistant using a blunt instrument, while the surgeon tied the polyester suture over the clavicle. Layer by layer wound closure was done after saline irrigation [Figure 2].

Post-operative rehabilitation

Antibiotic prophylaxis as well as analgesics were continued post-operatively as was the standard protocol of the unit. Each patient had a post-operative radiograph which was repeated at each follow-up visit. A shoulder sling was used for immobilisation for a period of 3 weeks. Range of motion exercises, mainly passive was commenced within the first 2 weeks after surgery. Active tolerable movement was commenced at 6 weeks post-operatively including daily activity. Heavy manual work was not allowed until after 3 months. The timetable for all follow-up was at 6 weeks, 3 months, 6 months and 1 year using clinical examination, plain radiographs as well as the QuickDASH scoring.

Statistical analysis

All data were collected and sorted. Data analysis was performed using Statistical Package for the Social Sciences (SPSS) software version 22.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were used to analyse the data, and the functional outcome was assessed using QuickDash. A value of <0.05 was used as the *P* value.

RESULTS

Demographic data

A total of 63 patients presented with ACJ dislocation during the study period. Eleven patients presented after 3 weeks of injury and were excluded. Four patients had associated ipsilateral clavicular fracture and were also excluded. Out of the remaining 48 cases with acute (<3 weeks) injuries, three additional patients were excluded due to follow-up loss within 3rd and the 6th month Following their surgeries. The remaining 45 patients were followed up for a minimum of 1 year after surgery, out of which there are 36 males and 9 females. Table 1 shows demographic characteristics of the patients. The mean age of the patients in this study was 31.51 ± 11.43 years, while the age group with highest frequency was 21–30 years accounting for 37.8% (17) of all the patients. We found right shoulder to be involved in 31 patients (68.9%) of the cases. Majority of the patients 10 (22.2%) were military officers [Figure 3]. The most common aetiology found in this study was road traffic crash accounting for 66.7% of injuries. The mean follow-up period was 23.3 ± 8.3 months (12–48 months).



Figure 1: Pre-operative and Post-operative plain radiographs of one of the patients. (a) Pre-operative anteroposterior (AP) view of right shoulder showing Rockwood type V acromioclavicular joint (ACJ) injury. (b) Post-operative AP view of right clavicle showing well reduced ACJ. (c) Twelve-month post-operative AP view of the right shoulder showing well reduced ACJ

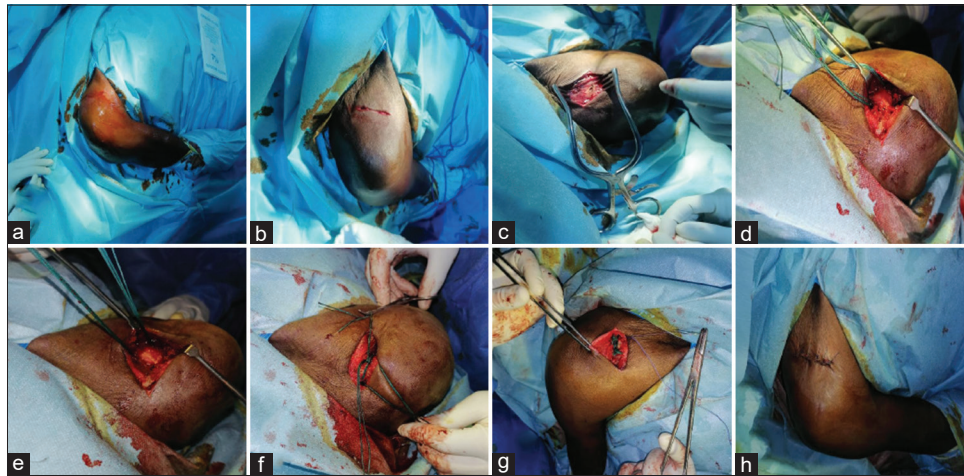


Figure 2: Intraoperative pictures of internal splintage of acute acromioclavicular joint disruption using polyester-5 suture (see text)

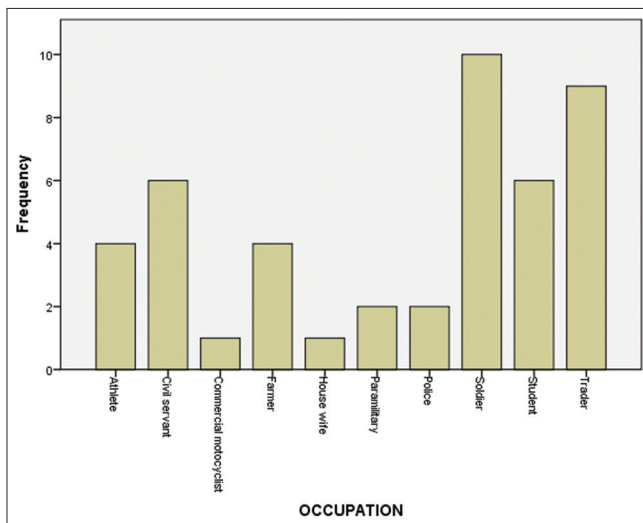


Figure 3: Patients' occupation

Outcome and patients satisfaction

The mean QuickDash score pre-operative and post-operative was 80.08 ± 10.75 and 3.23 ± 3.58 , respectively. There was a statistically significant difference between pre-operative and post-operative QuickDASH scores [$P < 0.001$; Table 2]. All patients studied were satisfied with the treatment offered. Seven (15.6%) patients had a partial loss of reduction after 6 months follow-up, but this does not have negative effect on their shoulder function and satisfaction.

DISCUSSION

The surgical treatment of ACJ injuries has evolved over time with understanding of the local anatomy and the biomechanics of the joint.^[2] Many surgical options have been described including static fixation such as use of hook plate, k-wire, screws and dynamic fixations such as the use tight ropes, sutures and ligament reconstruction using grafts. However, the 'gold standard' for surgical stabilisation of acute, painful AC joint dislocations is yet to be established.^[8] Different problems are associated with different types of surgical techniques. Kirschner wire fixation may be associated with wire migration.^[3,4,8,10] Hook plate and screw fixation requires second surgery for hardware removal and may be associated with infection, shoulder stiffness and acromion osteolysis.^[3,4,10,11] Percutaneous cannulated screw fixation resulted in a 32% failure rate due to screw pullout.^[12]

Although dynamic fixation is commonly performed recently, arthroscopic tight rope fixation of ACJ gives less morbidity, faster functional recovery and no need for a second surgery for implant/hardware removal.^[3,4,11-14] It is not without its complications such as clavicular fracture from bone drilling and loss of reduction after few months.^[3,4] Similarly, the use of tight rope require arthroscopy assistance, though also available in our environment but at extra cost to the patients who pay out of pocket for their healthcare because of inadequate health insurance scheme.^[3] This study made the use of minimal

Table 1: Demographic characteristics of the patients

| Demography | Frequency (n=45) | Percent (%) |
|---------------------|------------------|-------------|
| Age group | | |
| 11-20 | 4 | 8.9 |
| 21-30 | 17 | 37.8 |
| 31-40 | 11 | 24.4 |
| 41-50 | 8 | 17.8 |
| 51-60 | 4 | 8.9 |
| 60-70 | 1 | 2.2 |
| Total | 45 | 100.0 |
| Gender | | |
| Male | 36 | 80.0 |
| Female | 9 | 20.0 |
| Total | 45 | 100.0 |
| Side of injury | | |
| Right | 31 | 68.9 |
| Left | 14 | 31.1 |
| Total | 45 | 100.0 |
| Causes of Injury | | |
| Animal injury (Cow) | 1 | 2.2 |
| Fall from height | 5 | 11.1 |
| Road traffic crash | 30 | 66.7 |
| Sporting activities | 9 | 20.0 |
| Total | 45 | 100.0 |

Table 2: Comparing pre- and post-operative disability scores

| QuickDASH score | Mean±SD | P |
|----------------------|-------------|-------|
| Pre-operative score | 80.08±10.75 | 0.000 |
| Post-operative score | 3.23±3.58 | |

SD: Standard deviation

incision (4–6 cm) and less expensive readily available polyester (Ethibond-5) suture to achieve anatomical reduction, vertical and anteroposterior (AP) stability.

The only likely reason attributed to loss of reduction with tight rope and other techniques of suture fixation was suture breakage.^[3,4,10] The suture may be damaged or partly broken while being passed through bone tunnel.^[3,4,13-15] This study avoided bone drilling as the sutures were passed around the coracoid process and the clavicle. Hence, the likely complications of clavicle fracture and suture breakage were avoided. AP stability was achieved intraoperatively in this study; this could not be monitored radiologically as the only imaging done was AP radiographs. Seven (15.6%) patients were noted to have partial loss of reduction in this study. This does not have negative effect on their shoulder function and satisfaction at the last follow up. This is similar to the findings in previous studies that use tight rope and polyester suture loops.^[13-15] They reported loss of reduction in up to 16% of patients without corresponding loss of shoulder function. On the contrary, Zhang *et al.* found 25% loss of reduction, and the patients had inferior shoulder functional score compared to other patients without loss of reduction.^[15]

The loss of reduction in this study was vertical translation on plain radiograph. We could not assess the AP displacement and instability. All the patients in this study were satisfied with the treatment.

The limitations of this study include small sample size and inability to assess AP stability radiologically. We did not do a computerised tomographic scan for the patients due to costs as most patients pay out of pocket.

CONCLUSION

Due to the avoidance of hardware and its complications, avoidance of clavicle drilling and risk of fracture and no recurrence of ACJ disruption in this study; we concluded that internal splintage of ACJ dislocation using polyester-5 suture is effective and safe.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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