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Management of acromioclavicular joint dislocation by double Endobutton technique

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Abstract
Background: Acromioclavicular (AC) joint injuries are commonly seen with as many as 9% of all shoulder girdle injuries [1], commonly seen in young men, aged between 20 and 40 years with male-to-female ratio of 8.5:1 [2]. There are various surgical methods to treat AC joint dislocation. Recently, the endobutton technique has been elucidated for the treatment of AC-joint dislocation. Hence we employed this technique and analysed its outcome.
Materials and Method: 20 patients aged between 18-65 years with acute Type III–VI AC joint dislocation were included in the study. Radiograph of both clavicle anteroposterior (AP) stress view was obtained to diagnose. All patients were treated with Double Endobutton technique. Postoperative rehabilitation regimen was followed for all the patients. Outcome was assessed using Visual analogue score (VAS), Constant Shoulder Score (CSS) and AP radiograph of affected side at regular intervals. Descriptive statistical analysis done using Microsoft Excel 2016.
Result and Observations: Out of 20 patients, 17 were male, with overall mean age of 37.7±12.16 years. Left side was affected in 11 patients, which was non-dominant side. All 20 dislocations were of Rockwood type III. Most common cause was a fall. Mean postoperative VAS was 0.35±0.48 and mean postoperative CSS was 88.15±10.15 (p<0.001). At final follow-up, 4 patients showed loss of reduction. No other complications were noticed.
Conclusion: Double Endobutton technique is a simple, cost-effective, one-time surgery which restores the coraco-clavicular (CC) interval and maintains it till the native ligaments heal. It proves to be an excellent alternative modality to treat the AC joint dislocation.

Keywords: AC joint dislocation, double endobutton technique, CC ligament, endobutton, AC joint reconstruction. AC joint repair

1. Introduction
Acromioclavicular joint injury is one of the most common injury occurring in the young active individuals like athletes and people involved in contact sports [3, 4]. Rockwood type I and II can be treated non-operatively and type IV to VI require operative treatment for adequate reduction and stabilization of the AC joint. But the management of Rockwood type III AC dislocation is still controversial [5, 6]. There are various types of surgical methods to treat AC joint dislocation, but there is still wait for gold standard technique [7, 8, 9]. As of late, the endobutton technique has been elucidated for the treatment of complete AC-joint dislocation [10]. This technique allows to reconstruct the coracoclavicular ligament in its anatomical position and also for chronic AC-joint dislocation to achieve biological reconstruction of CC and CA ligament [11]. The technique has an excellent outcome and validated for biomechanical study with no risk of knot slip and no any second surgery of implant removal [12].

Aim and Objectives
To study the management of Acromioclavicular joint dislocation (Rockwood Type III - VI) by Double endobutton technique and to evaluate its functional outcome using Constant Shoulder Score (CSS) and also the radiological outcome.

Materials and Method
This 1year hospital based prospective study conducted between June 2019 and May 2020 in

the Department of Orthopaedics, SMCH, Silchar, included 20 patients aged between 18 and 65 years with acute (< 4weeks) Type III -VI AC joint dislocation. Radiograph of both clavicle AP stress view was obtained to diagnose the AC joint dislocation. All AC joint dislocations were treated with Double Endobutton technique. Patients were followed up at 2nd, 4th, 8th and 24th week. Post-operatively, operated limb was immobilized in universal shoulder immobilizer for initial 2 weeks, followed by pendulum exercise for next 2 weeks. ROM exercises were instituted after 4 weeks and strengthening exercises were allowed after 8 weeks. Outcome was assessed using VAS, CSS and AP radiograph of affected side at each follow up. The functional outcome was graded according to CSS as Excellent (90-100), Good (80-89), Fair (70-79) and Poor (<70). Descriptive statistical analysis was done for the data collected using Microsoft Excel 2016.

Surgical Technique

Patient is put on OT table in Beach-chair position. Regional anaesthesia is given. A 2-inch incision is made from the palpable tip of the coracoid to the anterior edge of the distal clavicle. Medial and lateral skin flaps are developed. The deltoid is split in line with its fibers, and the coracoid is identified and cleared off all the way to the base. The medial and lateral edges of the coracoid at the base are clearly identified. The guide wire, directed slightly anterior and lateral, is passed through the center of the coracoid base. Then, the 4.5-mm cannulated drill is used to ream over the guide wire. The appropriate size Endobutton is chosen and a fiber wire is placed through the first and fourth holes of the Endobutton. Using a 3.2-mm smooth cylindrical plunger, the Endobutton, along with its associated fiber wire, is pushed through the drilled hole until it ‘‘pops’’ out the underside of the coracoid. The suture placed through the holes is pulled up, locking the Endobutton onto the underside of the coracoid. Later on, the superior surface of the clavicle is dissected out, anterior and posterior borders are made clear. A point is marked 3cm medial to the AC joint and the guide wire is passed through the clavicle till it reaches coracoclavicular space. The same 4.5mm drill bit is used to ream over the guide wire through the clavicle. Using suture retriever, another fiber wire is introduced into the hole in the clavicle and pulled out through the coracoclavicular space. The second fiber wire is engaged with the first fiber wire such that when it is pulled out the first fiber wire passes through the clavicular hole. Then the suture tails going from the coracoid Endobutton exiting the top of the clavicle are placed through the first and fourth holes of the second endobutton. With the suture holder, the Endobutton is placed flat on the bone. With firm downward pressure on the clavicle to maintain maximum reduction, which is confirmed using image intensifier, tie the sutures on top of the Endobutton. Close the wound in layers.

Result and Observations

Out of 20 patients, 17 were male and 3 were female, with mean age of 37.7 ± 12.16 years (20-65 years). Left side was affected in 11 patients, which was non-dominant side. All 20 dislocations were of Rockwood type III. Most common cause was a fall. Other causes were RTA and fall from height. Average time from injury to surgery was 11.30 ± 3.26 days. The mean duration of surgery was 31.95 ± 3.97 minutes. Mean post-operative VAS was 0.35 ± 0.48 and mean post-operative CSS was 88.15 ± 10.15 (p<0.001) (Table 1 and Chart 1). At the final follow up, 3 patients showed subluxation and 1 patient showed complete re-dislocation. No other complications were noticed.

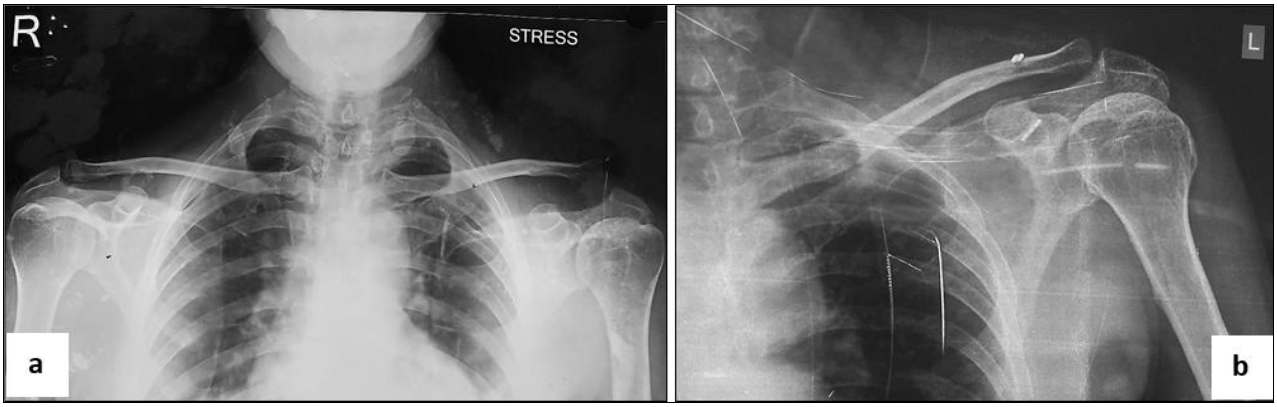

Fig 1a: Pre-op x-ray of both clavicle showing left AC joint dislocation. 1b: Post-op x-ray of left clavicle showing Endobutton device in-situ at the final follow-up

Fig 2a: Pre-op x-ray of both clavicle showing right AC joint dislocation. 2b: Post-op x-ray of right clavicle showing Endobutton device in-situ at the final follow-up. Note the complete re-dislo cation of the AC joint.

Table 1: Constant Shoulder Score

Outcome	No. of Cases	%
Excellent	10	50
Good	8	40
Fair	1	5
Poor	1	5

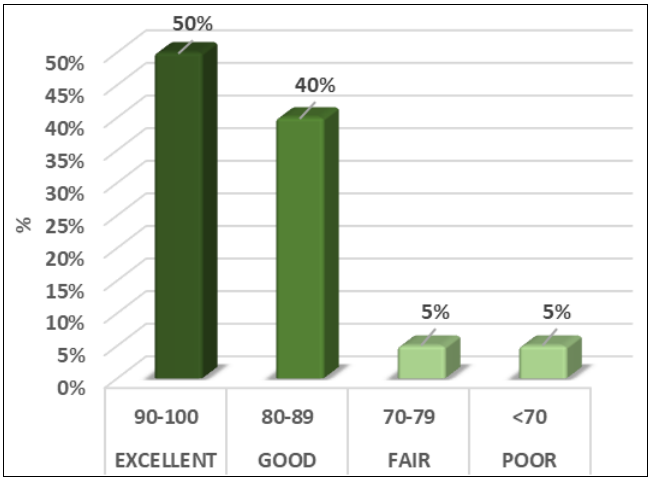

Chart 1: Constant Shoulder Score

Discussion

Common goals of various treatment options of AC joint injuries are pain relief, restoration of normal anatomy and biomechanics of the AC joint [13]. According to Steven Struhl and Theodore S. Wolfson [14], the long-term stability of AC joint requires initial strong fixation to maintain reduction throughout the biological healing process. Reconstructions using suture button configurations in anatomically placed drill holes have improved clinical results. Out of 20 patients, 17 were male and 3 were female, with mean age of 37.7 ± 12.16 years. The maximum number of cases were seen in the age group of 20-29 years. The age group and gender preponderance were attributed to the lifestyle and outdoor activities of the study population. These findings were comparable with that of the study conducted by Kraus *et al*. [15], Katsensis *et al*. [16], Saier *et al*. [17], Greiner *et al*. [18]. Out of 20 AC joints, left side was involved in 11 patients and was a non-dominant side. All AC joint dislocations were of Rockwood type III. Similar results were observed by Yi Zhao *et al*. [19] and Zanfaly *et al*. [20]. The most common mode of injury was fall, seen in 65% of cases, followed by RTA and fall from height. Although sports and contact injury has been described as the most common cause of AC joint dislocation, we didn't notice such cases in our study and we attribute this again to the lifestyle of the study population. The mean post-operative VAS was 0.35 ± 0.48 and mean post-operative CSS was 88.15 ± 10.15 (p<0.001). Salzmann GM *et al*. [21], Wei HF *et al*. [5] and Venjakob AJ *et al*. [22] observed similar results in their study. As per CSS, 50% cases showed excellent and 40% cases showed good results. Radiologically, reduction was maintained till the final follow-up in 80% cases and loss of reduction was observed in 20% cases. This finding is very much comparable with the studies conducted by Struhl and Wolfson [14], Shin and Kim [23], Zanfaly *et al*. [20], Zhang *et al*. [24], Bharat Sharma *et al*. [25] and L. Cai, *et al*. [26], which showed the risk of loss of reduction ranging between 10%-30%. Many complications are associated with the Double Endobutton technique like surgical site infection, suture failure, knot slippage, implant migration, AC joint arthrosis, heterotopic calcification of ligaments, foreign body reaction, perioperative fractures and loss of reduction. In our study, except for loss reduction, we have not noticed any other complications.

Conclusion

Double Endobutton technique is a simple, cost effective, minimally invasive, one-time surgery which gives better cosmetic and functional outcome. This technique restores CC interval to normal and maintains it till the native ligaments heal. It also provides optimum strength, time and environment for the native ligaments heal.

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None

Conflicts of Interest

On behalf of all authors, the corresponding author states that there is no conflict of interest.

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