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Outcome of acromioclavicular joint fixation with hook plate in rookwood type III, IV, V acromioclavicular dislocations

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Abstract

Acromioclavicular disruption is common injury in cases of athletic male adults. Internal fixation by Clavicular Hook plate fixation is one of the method used to treat Acromioclavicular Disruption. The aim is to study the results of Acromioclavicular joint fixation with Hook plate in Rookwood type III, IV and V Acromioclavicular dislocations. A Prospective analysis was performed on 22 patients treated with hook plate for acromioclavicular disruption in Department of Orthopaedics, SSG hospital, Vadodara from June 2017 to July 2018. All 22 cases were assessed post-operatively for outcome using the Constant-Murley shoulder function score and radiology at 24 weeks, 48 weeks and 8 weeks after the removal of the hook plate if patient provides consent for removal. In our study; 18 cases were Rockwood type III and 4 cases were Type V. The Constant-Murley Shoulder function score was average 72.4 (Satisfactory) at 24 weeks post-operative; average 80.6(Good) at 48 weeks in all 18 patients without removal of plate. Of 4 patients opting for removal of plate; Constant-Murley score was average 68.2 (Adequate) at 6 weeks post-operatively, which increased significantly to average 92.2 (Excellent) at 8 weeks after removal of plate. Hook plate is a good implant for fixation of Rockwood type III, IV and V Acromioclavicular disruption with minimal complications.

Keywords: acromioclavicular joint, dislocation, hook plate

Introduction

Acromioclavicular (AC) joint dislocation is a common injury in active young adults. AC dislocation is associated with acromioclavicular (AC) and coracoclavicular (CC) ligaments injuries and different levels of distal clavicle dislocation, which are combined for the judgment of grades of AC dislocation according to Rockwood classification^[1, 2]. Conventionally, grades I to III AC dislocations could be treated by conservative treatment^[3], while higher grades of injuries should be treated surgically^[4, 5].

Different approaches have been described for management of these injuries ranging from conservative management with bandages and slings to multiple surgical options including fixation of the acromioclavicular joint with pins, tension band wiring, the modified Weaver–Dunn procedure, fixation with washer and screw, suspensory fixation devices and clavicular hook plate. All of these options have their own specific advantages and disadvantages, but no clearly superior option has been established as yet^[6].

The clavicular hook plates are pre-contoured locking plates with varying sizes and depths as well as side to fit different anatomy. After reduction in the acromioclavicular joint, the hook is placed under the acromion process posteriorly and the screws are used to fix the plate to lateral clavicle maintaining the reduction. The manufacturers of the plate recommend routine removal of the plate after 3 months to avert the complications of subacromial impingement and acromial osteolysis. Clavicular hook plates have been demonstrated to be an effective implant option for surgical treatment of Rockwood type III, IV and V acromioclavicular dislocation but concerns have been raised about acromial osteolysis, subacromial impingement and even possibly rotator cuff injuries^[7-9].

The aim of our study was to evaluate and analyse results of Acromioclavicular joint fixation with Hook plate in Rookwood type III, IV and V Acromioclavicular dislocations.

Methodology

This is a Prospective study of 22 patients having Rookwood type III, IV and V Acromioclavicular joint disruption during June 2017 to July 2018 at SSG Hospital, Vadodara. There were 16 male and 6 females with male to female ratio of 2.67. All patients were treated with combined neck and brachial plexus anesthesia. After the commencement of anesthesia, patients were given Beach chair position with the injured shoulder raised. A curved incision was put along the distal clavicle to the acromion; the distal clavicle, the acromioclavicular joint and the acromion were exposed (Figure 1). If there was articular cartilage debris or loose cartilage disk in the acromioclavicular joint, it was removed first. Then the dislocated acromioclavicular joint was reduced and temporarily fixed. The hook end of a pre-bent SS plate was inserted into the rear bottom of the shoulder, and the proximal end of the plate was screwed into the clavicle. Intra-operative radiology confirms the reduction of dislocation, then non-absorbable suture was used to repair torn ligaments and acromioclavicular joint capsule, the incision was closed in layers. Postoperative cuff-collar splint was given for immobilization. Intravenous antibiotics were given for 3 days and were discharged and called for suture removal at 2weeks. Patients were called for follow-up 6 weekly till 24 weeks and at 48th week for Final follow-up. Functional outcomes were accessed using Constant-Murley Shoulder function score at 24 weeks (Mid-term follow-up) and 48 weeks (Final follow-up)^[10]. Shoulder anteroposterior X-ray (Figure 2) was taken at 12 weeks, 24 weeks and 48 weeks after the surgery or before the removal of the hook plate to study the subacromial osteolysis, osteoarthritis of the acromioclavicular joint and the reduced condition of the dislocation.



Fig 1: Anatomical landmarks and exposure of AC joint



Fig 2: Pre-op and Post-op x-ray



Fig 3: 2 months after plate extraction

Results

Our study represents the outcome of 22 cases of Acromioclavicular joint fixation with Hook plate in Rookwood type III, IV, V Acromioclavicular dislocations. The outcome was accessed clinically on basis of Constant-Murley shoulder function score and Radiologically with x-ray shoulder Anteroposterior view at 24 and 48 weeks. There were 16(72%) male and 6(28%) female, M: F ratio of 2.67 with an mean age of 38.2 years, predominant side was right handedness (81%), which was involved in 18 cases, mean Injury-to-surgery interval (ISI) was 2.6 days. In our study; 18 cases were Rockwood type III and 4 cases were Type V. The average score was 72.4(Satisfactory) at 24 weeks and 80.6(Good) at 48 weeks in 18 patients.14 patients had Good results, 2 patients having Satisfactory and 2 cases having Adequate outcome (Table 1). Out of 22 patients, 4 patients had complaint of Impingement who required plate removal during follow-up. Average Constant-Murley score was 68.2 (Adequate) at 24 weeks post-operatively before implant extraction which increased significantly to 92.2(Excellent) at 8 weeks after Hook plate removal. (Table 2)

Table 1: Outcome according to Constant-Murley Score

	24 weeks Post-operative	48 weeks Post-operative
Pain(15)	9.4	9.8
Strength(25)	20.6	24.8
Range of motion(40)	26.2	29.6
Activities of daily living(20)	16.2	16.4
Constant Score(100)	72.4(Satisfactory)	80.6(Good)

Constant-Murley Shoulder Function Score

Table 2: Outcome of 4 patients having Impingement

	24 weeks in cases having impingement	8 weeks after plate extraction
Pain(15)	6.6	13
Strength(25)	20.4	23.2
Range of motion(40)	26.0	37
Activity of daily living(20)	15.2	19
Constant score(100)	68.2(Adequate)	92.2(Excellent)

In our study no cases of hardware failure or infection was present. There were no fractures of acromion, coracoid process or lateral clavicle. Before the implant removal, 4(18%) patients had pain with impingement and restricted

motion of the shoulder (Constant score 68.2). Degenerative Arthritis changes in Acromioclavicular joint was found in 14(63.6%) of the cases and Osteolysis in 10(45.5%) cases.

Discussion

Acromioclavicular joint disruption is seen in young and active adults. The demographic pattern of acromioclavicular injuries has depicted a steep trend towards males sustaining these injuries with majority in the age group of 20–45 years^[11]. Our study population reflected the same with majority of the patients belonging to this age group. The role of sports-induced factors in these injuries has been well established, and a large number of patients (72.7 %) in our study were also found to be associated with such trauma^[12].

The probability of any surgical procedure and fixation device to maintain a congruent acromioclavicular joint and a good shoulder function is dependent on the fixation device which mimics the biomechanics of native acromioclavicular joint. The role of Kirschner wires and pins for fixation of acromioclavicular dislocation has high failures due to complications like pin breakage and pin migration^[13]. The results of coracoclavicular screw with or without ligament reconstruction has also shown inferior results in patients^[14]. The basis of using an anatomically contoured clavicular hook plate is the peculiarity of this device to mimic the acromioclavicular articulation. In view of this, we preferred to use the hook plate in our patients who were involved in strenuous physical activities.

The most significant disadvantages of conservative management of an acromioclavicular injury are an impaired shoulder function, pain, cosmetic deformity and effect on performance of patients involved in upper limb activities. All the earlier fixation methods led to an extremely rigid fixation; which impaired the rotational movement between clavicle and scapula^[15]. This aspect is taken care of by an implant-like clavicular hook plate which forms leverage between proximal end of plate fixed to distal end of clavicle and Hook of the plate which penetrates the undersurface of acromion and maintains the acromioclavicular articulation^[16].

The ultimate goal of surgical intervention in this set of injuries was to facilitate return to their pre-injury level of activity which was achieved in all the patients (Constant score of 80.6 (Good function) at 1 year follow-up) which is comparable to the results of earlier studies where hook plate has been used^[17]. The major disadvantages of hook plate cited in earlier series have been repeat surgery, persistent shoulder pain, incomplete shoulder function, acromial osteolysis and acromioclavicular subluxation^[18]. In our study, we had no surgical site infection. At mid-term and final follow-up, there was no incidence of subluxation of acromioclavicular joint. After fixation of AC joint with hook plate, Osteoarthritis of AC joint was found in 63.6% cases, osteolysis in 45.5% and Impingement in 18% (4 patients) cases. Out of 4 cases having impingement, the functional outcome of shoulder following removal of the hook plate improved significantly (from 68.2 (Adequate) to 92.2 (Excellent) after plate extraction) during subsequent follow-ups. There was no requirement of any repeat surgical intervention other than the removal of hook plate itself.

The hook plate in our experience is an excellent device to obtain a congruent acromioclavicular joint due to its unique biomechanical characteristics; which are most similar to a physiologic acromioclavicular articulation^[16]. The major drawback of using a hook plate is requirement of another surgery for removal of implant (4 patients in our study).

Though there were no complications in our study, the hook plates can cause disturbances over the subacromial bursa, supraspinatus tendinitis and acromial osteolysis, if retained for long time. We were able to avoid these complications by timely removal of the implant in patients with impingement. The limitation of our study is a relatively small sample size (twenty-two) and absence of a control group.

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