



CLINICO-FUNCTIONAL AND RADIOLOGICAL OUTCOME OF LATERAL END OF CLAVICLE FRACTURE MANAGED WITH SUBACROMIAL CLAVICULAR HOOK PLATE – AN PROSPECTIVE CASE STUDY

Orthopaedics

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ABSTRACT

Introduction :- The use of the acromioclavicular hook plate to treat lateral-third clavicle fractures is controversial. This is believed to be a result of issues with the hook plate such as impingement symptoms, which can result in chronic pain and movement limitations. Our goal was to assess the radiological functional outcome of individuals with lateral end clavicle fractures managed with subacromial hook plate. **Methods And Methodology :-** We prospectively reviewed all 16 patients who underwent surgery from July 2020 to August 2022 using our electronic patient information database. All patients were assessed in the out patient department to determine both Oxford and Constant shoulder scores to assess the clino-functional outcomes. **Results:-** Among 16 patients who underwent surgery with the hook plate, 10 male and 6 female. The mean age was 36.2 years. The median length of hospital stay was 4 days. The median follow-up was 12 months. The median time from date of injury to surgery was 7 days one patient presented 4 months after injury. The mean time for fracture union was 3 months from the date of surgery and the union rate was 95%. In total, 13 of plates were removed. The median time for implant removal was 4.5 months. **Conclusion:** In a case of fracture lateral end of Clavicle, open reduction and internal fixation with clavicular hook plate achieves reliable internal fixation with early mobilization. In view of this we state that clavicular hook plate is an reliable option for treating these types of fractures.

KEYWORDS

INTRODUCTION

Approximately 12–15% of all clavicle fractures are lateral end fractures. These commonly occur as a result of a fall on an extended hand or even a direct blow to the shoulder^[1]. Such fractures are frequently categorized using Neer's classification^[2]. Depending on how they relate to the coracoclavicular ligaments, they are categorized. The majority of lateral end clavicle fractures are type I fractures that happen laterally to the coracoclavicular ligaments. Due to the ligaments holding the medial fragment in place in relation to the lateral fragment, such a fracture does not cause displacement. The coracoclavicular ligaments in type II fractures are detached from the medial fragment, but the trapezoid ligament is still connected to the lateral fragment. Acromio-clavicular joints are affected by type III fractures. Because the coracoclavicular ligaments are torn and are no longer able to hold the medial fragment in place, type II fractures are more likely to result in displacement. The lateral fragment separates from the medial fragment due to the weight of the arm. In these fractures, the non-union rate might reach as high as 22–31%^[3,4]. In comparison to those treated operatively, non-operative management of these fractures is associated with a greater frequency of prolonged shoulder function impairment non-union. It is also associated with acromioclavicular (AC) joint arthritis^[5,6,7]. Numerous surgical fixation strategies have been suggested. They consist of lateral end anatomical plating the fracture, clavicle excision, Kirschner wire stabilisation, Bosworth screw fixation from the clavicle to the coracoid process and modified Weaver–Dunn restoration of coracoclavicular ligaments. Our study's goal is to share our knowledge, discoveries, and clinico-functional and radiological outcomes from managing fracture of the lateral end of the clavicle with open reduction and internal fixation with clavicular hook plate. The functional outcomes were evaluated using the oxford shoulder score and Constant shoulder scores.

METHODS AND METHDOLOGY

After IHEC approval 16 cases of fracture of lateral end of clavicle were included from July 2020 to August 2022 that presented to our institute, clinical and radiological assessment were done preoperatively and anesthetic fitness was obtained and were managed with Open reduction and internal fixation using clavicular hook plate. Standard

superior approach for distal end clavicle was used in all cases, postoperatively clinico-functional outcomes were assessed using oxford shoulder scores and constant shoulder scores, radiologically fracture union was assessed for all patients at 6 weeks, 8 weeks, 12 weeks and after implant exit. Implant exit was planned after complete union of fracture on x ray.

Outcome data included patient demographics, smoking status, union, time from injury to surgery, time from surgery to removal of plate, length of hospital stay, time to union, and any complications that occurred. The Oxford shoulder score is particularly sensitive in revealing shoulder girdle problems^[8]. Union of fractures was defined radiologically when 3 of 4 cortices were healed on 2 separate radiographs (Fig. 3). This was assessed prospectively and independently after review by 2 senior members of the orthopedic team. Union was accepted after independent agreement between the two.

Operative Techniques :- Under General anaesthesia, patient in beach chair position, right clavicular region prepped, painted & draped, through standard superior approach skin incision made, subplatysmal layer and clavipectoral fascia dissected and fracture site was exposed, fracture ends were freshened up and under fluoroscopic C- arm guidance fracture reduction done and fixed with subacromion hook plate with 2.5 mm cortical screws was done. Thorough wound wash given and wound closed in layers. Sterile dressing done and broad arm sling applied. Postoperatively, patients are managed by use of a shoulder sling for 1 week before starting early range of movement. They are advised against range of movement above 90 degree in flexion or abduction and to avoid sporting activity and heavy physical activity.

After data collection, the data were entered into an MS Excel spreadsheet and statistical analysis done in SPSS software. Paired t tests was used to compare Oxford and Constant scores.

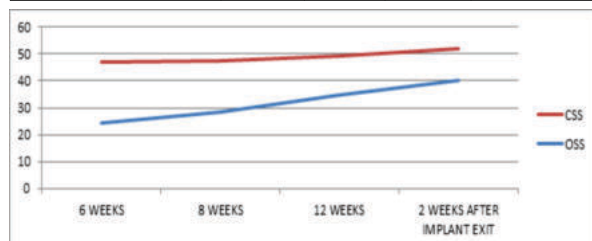
RESULTS

16 patients were included and all 16 had undergone ORIF with the

clavicle hook plate. There were 10 male and 6 female, with a mean age of 36.2 years (range, 22-60 years). Indications for ORIF were acute fractures in all of them except in one case who has presented to us after 4 months of injury. The median time from injury to surgery in the acute fracture group was 7 days. Mean follow up period was 12 month mean time duration of implant exit was 6 months. The Oxford and Constant shoulder scores are shown in Tables 1. Statistically significantly better. Oxford and Constant scores were obtained at 6 weeks, 8 weeks, 12 weeks and after implant exit.

Table – 1 Represents The Mean Oxford And Constant Shoulder Scores

Scoring System	6 Weeks	8 Weeks	12 Weeks	After Implant Exit
Oxford Shoulder Score	24.3	28.6	34.8	40.2
Constant Shoulder Score	22.7	18.8	14.4	11.9



Graph – 1 Represents Mean Oss And C55 At Regular Follow Ups.



Fig 1a – Clinical Picture; Fig 1b- X Ray Of Right Shoulder At Presentation



Fig 2a [above] – Intraoperative Images Showing Open Reduction And Internal Fixation With Sub Acromial Clavicular Hook Plate

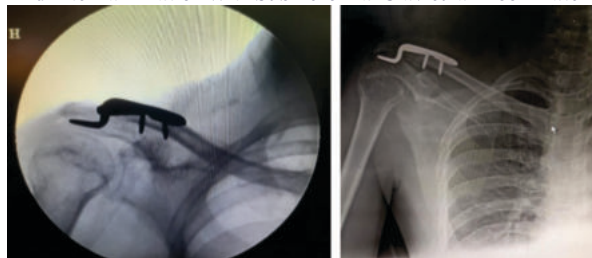


Fig 2b [below] – Intraoperative C Arm Image [left Side]; Postoperative X Ray [right Side]



Fig 3 A Post Implant Exit X Ray And The Hook Plate That Was Removed.



Fig 3b – Demonstrates The Shoulder Range Of Movement After Implant Exit.

DISCUSSION

Lateral end clavicle fractures if not managed appropriately usually results in non union. The chances of non-union of lateral end of clavicle is between 22%-50% if managed conservatively^[9,10,11]. This high incidence of non-union may be due to the underlying soft tissue damage and soft tissue interposition between fracture fragments. Consequently, many authors prefer surgical intervention to conservative treatment for these difficult fractures^[12,13,14]. There are several different surgical options available to treat these fractures. PDS and Dacron tapes used as a sling have produced satisfactory results. However, coracoid fracture and erosion of the clavicle are well-recognized complications^[15,16]. Coracoclavicular (Bosworth) screw interferes with the rotational movement of the clavicle, and this may lead to implant breakage and a poor outcome^[11]. Trans articular K-wire fixation gives a poor fracture stabilization^[17], preventing early mobilization; complications such as implant failure, pin tract infection, and wire migration have been reported with this technique^[18,19]. In the vast majority of these fractures, the lateral fragment is rather small hence lateral end anatomical plate, internal fixation using either an interfragmentary screw or a reconstruction plate may not be technically possible or may not provide the required stability to commence early mobilization^[18].

Lateral end anatomical plate has been anatomically created to fit the clavicle's lateral third. It enables the placement of screws in various directions inside the lateral third of the clavicle, offers multi-planar fixation, and increases the stability of small, unstable lateral fragments. The lateral end of this plate has up to six small, in-different-direction locking screw holes. Screws feature a stronger pull-out force and a locking mechanism that prevents them from requiring to be engaged in the opposite cortex. This plate's design maintains a solid grip even in fractures caused by osteoporosis by counteracting forces acting on the fracture fragments but however use of this plate in fracture patterns where the distal fragment of lateral end of clavicle is too small is challenging situation for surgeon and hook plate is one of the better alternative implant to fix these type implant.^[18]

The design of the hook plate seems to have addressed most of the pitfalls of other methods of fixation. For medial fixation, the plate comes in 2 different sizes: 4 holes and 6 holes. Lateral fixation is addressed by 2 means. First, the hook is designed to be seated underneath the acromion will stabilize the fracture fragment and along with screw fixation in medial side the fracture will reduced in anatomical position. Second, the widened lateral part of the plate has 2 elongated holes allowing for several options of screw placement. Hence, this plate can potentially offer good stability, allowing early mobilization. Biomechanical studies have shown that rotational movement occurs between the clavicle and the scapula during flexion and abduction of the humerus^[20]. The hook plate does not restrict this rotational movement; therefore, maintaining the stability of fracture fixation without adversely affecting the biomechanics of the acromioclavicular joint. Despite that, only a restricted range of movement is allowed in our rehabilitation regimen until the plate is removed, in order to avoid undue stress against the acromion and consequent erosion and fracture. The necessity of removing the plate is the main drawback of this technique, as it adds to the cost and necessitates a second operation. A recent MRI study into the effect of the plate on the sub acromial space revealed no increase in rotator cuff lesions but showed an increase in the incidence of extra-articular ossification. Treatment of type II fractures of the lateral end of the clavicle using hook plate fixation is not without complications however it offers an acceptable alternative method that is easy to apply with predominantly good results furthermore, it allows early mobilization and maintains acromioclavicular joint biomechanics.

CONCLUSION

In a case of fracture lateral end of Clavicle, open reduction and internal fixation with clavicular hook plate achieves reliable internal fixation with early mobilization. In view of this we state that clavicular hook

plate is an reliable option for treating these types of fractures.

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