Treatment of fractures of lateral end of clavicle with open reduction using clavicle hook plate

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Abstract

Background: Fracture of lateral end clavicle constitutes merely 15% of clavicle fracture, only a third of these fractures are displaced. No solo treatment method has been hailed as the most favored technique to deal with the fracture lateral end clavicle, yielding consistently good union, with least complications.

Objective: This early study attempts to assess the role of Clavicle Hook Plate, in the dealing of lateral end clavicle fractures, whether it promises to be the most preferred technique.

Material and Methods: To assess the results and long term effects in use of this plate we performed a retrospective analysis with a mean follow up of 24 months (2 years) of 20 patients with acute displaced lateral clavicle fractures, fixed with the clavicle hook plate.

Results: Our short term results in all patients were first-class to excellent. None underwent non-union. Impingement symptoms were detected in 4 patients, 1 patient had skin/soft tissue issues and 1 had infection, warranting early implant removal. Patients were re-evaluated at a mean follow-up period of 2 years.

Conclusions: Clavicle hook plate is a reasonably good key treatment choice in fixing the acute displaced lateral end clavicle fractures. Proper selection of patients with good skin conditions and infection control are essential.

Keywords: Treatment, fractures, lateral, clavicle, hook

Introduction

Fracture of lateral end of clavicle is 15% of the total clavicle fracture, although conservative treatment of clavicle fractures has been very well acknowledged by the society but lately patients are turning more demanding shifting the management towards operative side. Usually 1/3rd of these fractures get displaced (Type 2 Neer’s or Type 3B1 Edinburgh) [1]. The clavicle hook plating has emerged as a revolutionary surgical option for such fractures [2, 3, 4, 5, 6, 7, 8, 9, 10, 11]. It has been amply proven by time that union has never been a bothersome issue in these fractures, but even a decade ago it was convincingly shown in a study that long term complication of the clavicle fracture can occur like acromio -clavicular joint problems [11].

To assess the role of hook plate in lateral end clavicle fractures, we studied & followed up the selected patients for an average period of 24 months. 20 patients presented in our department OPD and Emergency, with acute lateral clavicle fractures, who had displacements past the limits of acceptability, hence were treated with the open reduction and clavicle hook plating.

Material and Methods

20 consecutive patients were chosen who had displaced fractures, in a tertiary care hospital who had been operated for hook plate were retrospectively evaluated. The hospital caters both urban and of rural population in. 60% of the population includes farmers and semi-skilled labourers and workers. Majority of patients are high demanding as far as range of movements and heavy weight lifting ability is concerned. The cases were followed up for 2 years by the same surgical team which operated upon the individual patient, to eliminate any bias. The movements (active & passive both) were started on 7th post-operative day. Union was assessed from time to time after 3 and 8 weeks. Following which patients were advised resumption of normal daily activities, except heavy weight lifting for total 3 months or radiological sound union.
The case history and examination sheets were analysed and post-operative X-rays were re-analysed. Following the initial evaluation, we examined the patient in OPD. Range of shoulder movements were carefully evaluated as passive and active function separately to be included with subjective perceptions for DASH scoring.

**The Hook-Plate:** This plate is a 3.5mm pre-contoured stainless steel/titanium, dynamic compression, locking/non-locking plate, with a wider anterolateral end and a lateral extension with a step low, into a hook which can be slid below the acromion. The objective being that the plate itself rests along the superior surface of the fractured clavicle fragments while the hook anchors below the acromion. These plates are available with 6 or 8 holes and the hook depth being 15mm.

**Technique:** The patients were operated in supine position, with a bolster underneath the operable shoulder under general anaesthesia. The arm is kept on the affected side, free to move. A curved skin incision, placed over the fracture was used in all the cases. Skin flaps were elevated, taking care to keep the flap as thick as possible to ensure its viability. The fracture fragments were dissected with minimum soft tissue periosteal elevation. The fracture fragments were reduced carefully and were temporarily fixed with smooth K-wires. Under image intensifier AC joint was located. The soft tissue dorsal to the AC joint was slit just enough insertion of the hook of the plate. First the hook the plate hook depth is manoeuvred below the acromion. The shaft of the plate was placed on the superior aspect of the clavicle and fixed with a K-wire, the reduction of fragments were confirmed by rotating image intensifier to get oblique views of fracture. The well pre-contoured plate aligns well with the clavicle, but was bent if need be. The plate was fixed with locking screws. Adequate precaution was taken to avoid injury to the underlying neurovascular bundle. The wound closed without tension, with cosmetic subcutaneous sutures, to hold over the plate.

**Results**

All twenty patients with a displaced lateral end clavicle fracture, were operated in supine position with open reduction and internal fixation by the clavicle hook plate. Mean age was 40 years (range 20-60) male to female ratio was 16:4. All patients had an Edinburgh Type 3B1/ Neer Type II fracture. Mean time to operation was 3 days and the mean operating time was 60 minutes 30 to 90 minutes, from start of incision to closure. All patients were discharged on the second or third day of surgery depending on the condition of the wound on first dressing and pain status of patient according to VAS score. All the patients were followed up for average 2 years with first visit to the OPD a week after the surgery followed by 3 weeks, 6 weeks, 9 weeks, 3 months, 9 months, 18 months and so on.

Our short term results in all patients were first-class to excellent. None underwent non-union. Impingement symptoms were detected in 4 patients, 1 patient had skin/soft tissue issues and 1 had infection, warranting early implant removal. Patients were re-evaluated at a mean follow-up period of 2 years.
Discussion

In our study, there were 20 patients, out of which 4 patients (20%) were female and 16 patients (80%) were male with male to female ratio is 16:4. If we divide the patients in age groups 6 patients (30%) were between the age group of 31-40 years, 4 patients (20%) were between the age group of 21-30 years, 4 patients (20%) were between the age group of 41-50 years and 2 patients (10%) were between the age group of 51-60 years with the mean age of 40 years. On comparing the patients on the basis of time between the injury and the operation, all the patients had duration between 0-5 days, with the meantime 2 days. The mean intra-operative time from incision to closure was 60 minutes. We followed up the patients for an average time of 2 years and evaluated with the DASH score. The mean DASH score was 1.27. During follow up 1 patient reported skin incision irritation pain and 4 of these patients were diagnosed with impingement and this resolved shortly after plate removal the patients with impingement has symptoms of discomfort and pain between 70 and 130 degree of elevation (abduction in the plane of scapula). Impingement was confirmed by neer impingement test i.e., local injection of 2% lidocaine 2ml, under the acromion, in sub-acromial space, bringing relief to the pain instantly.

One patient suffered infection, probably due to uncontrolled diabetes. This patient ultimately required implant removal, despite suitable intravenous antibiotics being injected after pus culture and sensitivity. The organism grown was staphylococcus aureus, though sensitive to regular antibiotics, couldn’t be controlled until the plate was removed.

The single patient with skin irritation was probably due to incision just overlying the plate and screws. Locking screws that merge in the plate thickness do have an advantage. Despite all patients were advised to remove the plate after clinical and radiological consolidation, ur results were comparable with Flinkkila et al., [6] he compared K-wire fixation to hook plating. Although the functional results were same, still they advised hook plates because of migration and infection in the former group. Lee et al. [5] compared K-wiring with tension band wiring to hook plate fixation. Their results showed that the group with the hook plate had earlier regained of pre-injury activities. The K-wire fixation group had 30% complications mainly related to hardware failure.

Neer has described fracture lateral clavicle as an unstable clavicular fracture needing operative treatment because of increased incidence non-union and rate of delayed union. His explanation is by that the deforming forces around the fracture, and interposition between the fracture fragments, along with continuous motion at the fracture ends contribute to the aforesaid prognosis.

The clavicle hook plate is a simple to use implant that withstands forces that are applied to the fracture fragments. By it’s shape it keeps the lateral end of the clavicle aligned, thereby reducing the clavicle with the ligaments and minimizing movement at the fracture ends without interfering with rotation of the clavicle [22].

The results published in several studies [2-11] Show good results regarding bony union and in terms of shoulder function. Shoulder function is checked with the use of Constant-Murley & DASH scores. The DASH score is below 5 and the Constant-Murley score comes around 90. Non-union is seldom, below 10% which is comparable to our study.

Conclusions

Clavicle plate in our short study, has shown without a doubt tried and true necessary treatment decision in treating the severely displaced lateral end clavicle fractures. A strict convention of legitimate choice of patients, with great nearby skin conditions, dealing with all systemic ailments (obliged to bring about post-agent issues) are taken into consideration before going with the clavicular hook plate fixation.

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