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## Treatment of displaced lateral clavicular fractures with hook plate, a retrospective review

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### Abstract

Fractures of the clavicle have been treated historically by conservative means. However lateral end fractures of clavicle are known to be unstable due to injury to the coracoclavicular ligaments. Hook plate has been used in open reduction and internal fixation of displaced lateral end clavicle fractures. This is a retrospective study of 28 cases of displaced lateral end clavicle fractures treated with ORIF with hook plate, in our hospital between Jan 2009 to Feb 2012. Constant –Murley shoulder function scoring system and DASH scoring was used to evaluate shoulder function. Average Constant Murley score was 86.5 at 4.5 years follow up. Average DASH score was 2.65. Three patients exhibited radiological signs of acromio-clavicular joint arthrosis, and one was symptomatic. All patients achieved bony union. One patient had infection which necessitated debridement, but fracture united

**Keywords:** Displaced, Lateral clavicle fracture, ORIF, Hook plate.

### Introduction

Clavicle fractures have been looked upon with disdain by the majority of orthopaedic surgeons relegating the patient to a junior resident for a figure of 8 cast. Displaced lateral clavicle fractures are a different ball game altogether. They are frequently associated with disruption of coraco-clavicular ligaments and are inherently unstable fractures. Type-2, Neer). Open Reduction Internal Fixation (ORIF), is considered recommended treatment for these fractures. Various techniques of stabilization have been practiced and we present our study of Hook Plate in relation to displaced lateral clavicle fractures. We found that ORIF with hook plate produced acceptable results and did not adversely impact shoulder function.

### Materials & methods

We retrospectively reviewed 28 patients who underwent ORIF with hook plate for displaced lateral clavicle fractures between 2009 & 2012. Both authors performed the surgeries on a random basis. There were 25 males and 3 females; mean age was 45(Age range 22-65). 27 cases were type 2A Neer and one was type 2B Neer. 24 patients had right sided involvement, 4 patients had left sided involvement. All patients underwent ORIF within a week of injury and implant removal was done after 6-9 months postsurgery. Standard operative procedure as advised by ‘Synthes clavicle hook plate, technique guide (2003 Synthes)’ was followed. All patients were operated in beach chair position under general anesthesia with arm on the affected side freely movable. Longitudinal incision was made along the contour of the clavicle over the fracture site and deepened to expose the fracture fragments. Reduction and temporary fixation with Kirshner wires was done, followed by hook plate application. Plate size was chosen as recommended by synthes technical guide. Wound was closed in layers over suction drain.

### Results

A total of 28 patients were treated with ORIF with hook plate between 2009 & 2012. Mean age of patients was 45(Age range 22-65). 25 patients were males and 3 were females. 27cases were near type 2A & one case was type 2B. Patients were operated between day2- day7 of injury, mean time for surgery being 3 days. Operating time was between 40 min- 90 min; mean 555 min. Average blood loss was 250 ml (range 150-300ml).

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Patients were discharged on day 6 after the second post op dressing on day 5. Plate was removed routinely in all patients between 6-9 months post-surgery. Patients were evaluated at 6 weeks, 14 months and at the end of 26 months. All patients were available for follow up.

Statistical analysis was done using PSPP-GNU Project Software.

At 6 weeks follow up, radiographic evaluation, wound inspection was done and physiotherapy was initiated. One patient had infection which required debridement and eventually went on to uneventful union.

At 14 mths, i.e after the implant was removed and at 26 months postsurgery, Constant Murley scoring and DASH scoring was done, along with radiographic evaluation for subacromial osteolysis and AC joint arthrosis.

Average Constant Murley score at 14 mths was 77.5 and 86.5 at 26 mths, following index procedure. Average DASH score was 3.6 at 14 mths and 2.65 at 26 mths postsurgery. 4 patients had subacromial osteolysis at 14 mths which resolved by 26 mths. 3 patients had AC joint arthrosis at the end of 26 mths but only one patient was symptomatic. There was no implant breakage, nonunion in our series.

**Table 1**

	DASH score 14 mths	DASH score 26 mths	p- value
Normal xr(24)	3.5	2.5	0.007
Osteolysis(4)	3.7	2.8	0.052
Total	3.6	2.65	0.004

**Table 2**

	Constant score- 14 mths	Constant score- 26 mths	p- value
Normal xr (24)	78	88	0.001
AC joint (3)	77	85	0.034
Total	77.5	86.5	0.004

**Discussion**

Displaced lateral clavicle fractures were described by Neer [1] as an unstable fracture requiring ORIF due to high rate of

nonunion and delayed union by conservative treatment. Robinson & Cairns [2] published their results of conservative treatment for first six months and subsequent surgery relating to symptomatic worsening. They operated only 14 % of patients with persisting symptoms after 6 months. Some authors have advocated that need for surgical treatment is controversial as nonunion seldom produces a poor functional outcome [3, 4].

Kirshner wires have been used to fix this fracture. Some have advised against its use [5]. Lee *et al.* [6], compared kirschner wire fixation with tension band wiring and hook plate fixation. They had 30 % complications in K wire group due to hardware failure. Kas [7] *et al.* recommended kirschner wire fixation and tension band wiring. Swamy & Swamy [8] also recommended transacromial kirschner wire fixation for displaced lateral clavicle fractures.

Other options described in the literature include coraco-clavicular fixation such as Bosworth screw fixation [9, 10]. Others have described coraco-clavicular fixation with PDS suture, Dacron Patch or endobutton [11, 12, 13]. Regazonni [14] *et al.* described double plating using mini AO plates with good results.

Kaifer [15] described in detail the biomechanical stabilizing function of hook plate. Various publications have demonstrated good results of hook plate fixation [16, 19].

Various complications of hook plate have been documented, common among them being, subacromial bursitis, impingement, subacromial osteolysis and AC joint arthrosis [20, 21]. Impingement, subacromial bursitis and subacromial osteolysis on XR are signs of a mismatch between the plate and the anatomy, and as such reflects the technicality of the surgery. This can be minimized by refinement of surgical technique.

Charity [22] *et al.* reported 3 cases of fixation failure probably due to osteoporosis. They cautioned against early active mobilization of the shoulder in elderly patients with poor bone and soft tissue quality. Nordqvist [23] *et al.* reported 89 patients of AC joint arthrosis in their study.

In our study 3 patients showed AC joint arthrosis on XR but only one was symptomatic.

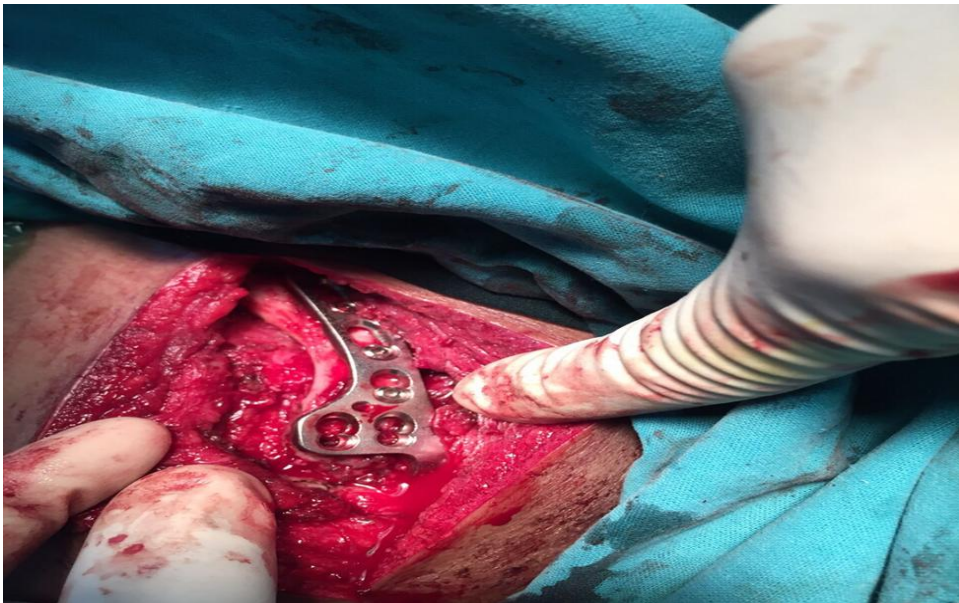
**Pre-Operative Skin Marking**



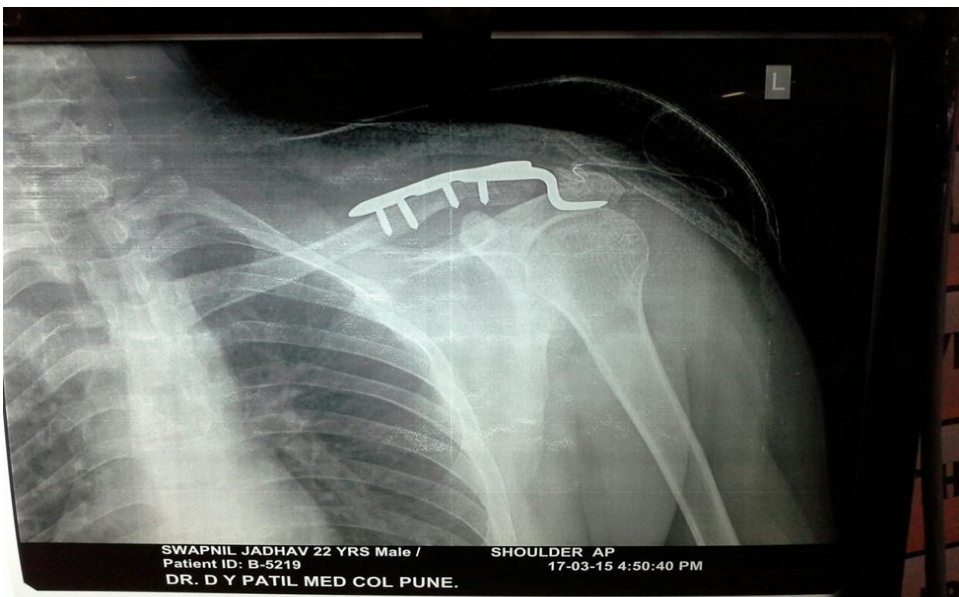
**Exposure of fracture**



**Plate Application**



**POSTOP XR**



## Conclusion

We recommend Hook Plate fixation as a primary treatment for displaced lateral clavicle fractures. Though complications and dysfunctions have been documented, we believe it is fairly dependent on meticulous surgical technique, and that majority of the problems resolve after implant removal and long term shoulder dysfunction is not a common occurrence. However, large sample size and comparative study with other modalities is worthwhile pursuing.

**Conflict of Interest:** The authors report No Conflict Of Interest.

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