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## Functional outcome of midshaft clavicle fractures treated with open reduction and internal fixation with plating

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### Abstract

**Background:** Clavicle is one among the most common fractured bones; accounting for up to 3% of all adult fractures. It is entirely superficial and transmits all the force absorbed by the upper extremity to the thorax, which explains its vulnerability to injury.

Traditionally, though the fracture had been treated non-operatively, even when substantial displacement was present, the mode of open reduction and internal fixation of displaced fracture shaft clavicle provides better functional outcome preserving the shoulder biomechanics which is required for overhead activities; also considering the anatomy of the clavicle, that being an atypical long bone with absence of a true medullary cavity, the scope of intramedullary fixation is limited and one should not ignore the stress yielding effects of a plate resulting in refracture while plating a slender clavicle. This study is aimed at assessing the functional outcome of patients who underwent open reduction and internal fixation of clavicle fractures treated by plating.

**Keywords:** Functional outcome of clavicular plating

### Introduction

The clavicle fracture contributes to 2.6–4% of all fractures and between 35% and 44% of all injuries around the shoulder girdle<sup>1-3</sup>, of which 80% of them occur in the middle third. Though traditionally the treatment was conservative, the consensus is changing towards open reduction and internal fixation for displaced fractures as conservative line of management for the same gives unsatisfactory results<sup>4</sup>. Operative modalities for clavicle fixation includes Plating (Anatomical plate/Recon plate), Nailing (Rockwood pin/K-wire/TENS), of which plating is considered as superior to all other modalities<sup>5</sup>. With the advent of better surgical techniques, it is very evident that patients are able to get back to their activities at the earliest<sup>5</sup>. Things to be kept in mind are the anatomy of the clavicle, that being an atypical long bone with absence of a true medullary cavity, the scope of intramedullary fixation is limited and one should not ignore the stress yielding effects of a plate resulting in refracture while plating a slender clavicle. The aim of this study is to present the outcome of surgical treatment of midshaft clavicle fracture in adults by open reduction and internal fixation with superior reconstruction plating.

### Materials and Methods

The study was conducted in Yenepoya Medical College, Mangalore, Karnataka during 2017 to 2019. It is a retrospective study which included 30 patients who underwent open reduction and internal fixation of clavicle with plate for displaced fracture clavicle (Allman group I<sup>6</sup>). All patients were followed up clinically (with Oxford shoulder score) and radiologically at regular intervals upto a period of one year. The functional and radiological outcomes were tabulated and was analysed using IBM SPSS software (version.22).

### Protocol for management

Displaced fracture clavicle ORIF with superior reconstruction plating (Anatomical Plate) Shoulder shrugging exercises and immobilisation in pouch arm sling (3 weeks) 6-8 Weeks

### Correspondence

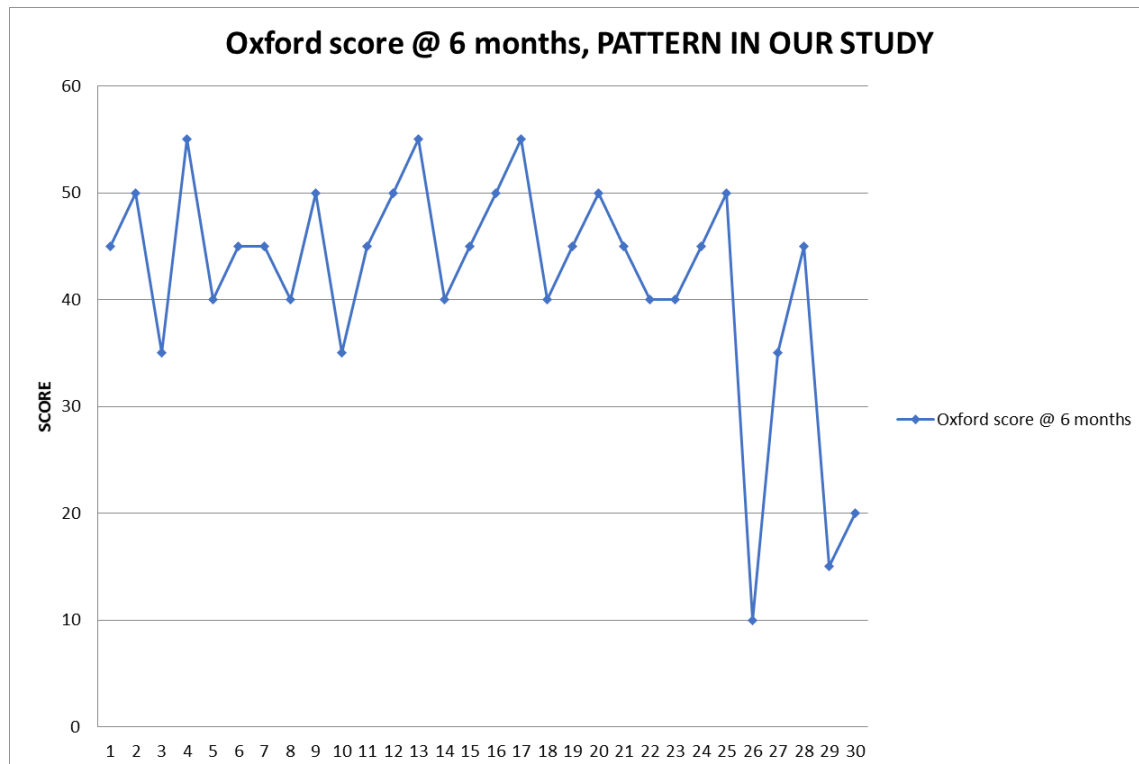
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Radiograph-? Satisfactory callus >>YES>> Active shoulder abduction and flexion (up to 90) 12-20 Weeks Radiograph-? Uniting fracture>>YES>>Overhead Activities initiated @24 weeks, Oxford Shoulder scoring>> Satisfactory scores (>40), full range of movements permitted

### Results

Our study included 30 patients, of which 5 patients were females and 25, males. 20 patients had fracture midshaft of right clavicle in contrast to 10, having left sided midshaft fracture. All patients underwent open reduction and internal fixation with anatomical plates; post-operative management was strictly followed as per protocol. 50% patients had paraesthesia around the anterior aspect of chest, which was improved at the end of 6 months with neurotropic drugs. Few

complications noteworthy were 1 patient went into delayed union, 1 had refracture after implant removal and 1 patient deviated from post-operative management protocol, resumed his activities prematurely and had a bent plate, for which he had to undergo resurgery. 3 patients had complained of inferior migration of scar. 16 cases showed radiological signs of union within 8 weeks post op, 5 cases at 10 weeks and the rest around 12 weeks post op. None of these cases went into non-union, but of these cases one non-union case was plated with bone grafting which united at around 12 weeks and one case of clavicle fracture which was treated conservatively previously, came with subclavian artery aneurysm, which with the help of a vascular surgeon was removed and the clavicle was plated, but the patient was lost in follow up. Oxford shoulder scoring



**Fig 1:** oxford shoulder scoring at 6 months

### Discussion

Though literature incidence is about 2-4% for clavicular fracture; we believe the incidence has increased considering the increase in number of road traffic accidents involving 2 wheelers. Conventionally, conservative has been the treatment choice for clavicular fractures irrespective of deformity, non-union and compromised shoulder function.

Today where patients look out for early recovery and quick results, we believe surgical intervention does have a role in clavicle fractures. A horizontally placed long bone connecting the trunk to the upper limb cannot be immobilised completely. Presently available braces do not completely immobilise the fracture completely and does cause a lot of pain and disability whenever patient wants to lie down. We did notice in our study that patients were demanding for a treatment which can relieve pain at the earliest and can allow them to ambulate themselves. We also had patients with clavicle fractures who were advised brace treatments demanding surgical intervention within the first 2 weeks. We also noticed that plating is the best method of internal fixation to region of mobility of ipsilateral shoulder during rehabilitation.

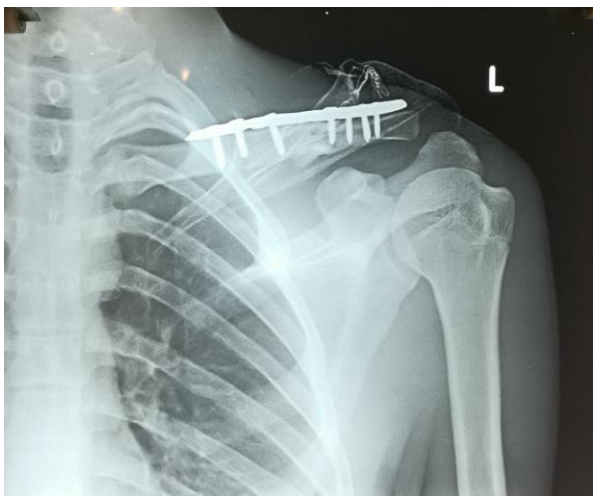
However, we did have postoperative complications like implant failure which may be attributed to the poor tensile strength of existing clavicle anatomical plates. Other complications like post-operative anaesthesia over the infraclavicular area due to supraclavicular nerve injuries were also seen. These were successfully managed using oral pregabalin and methylcobalamin supplementation for 3-6 months. The case of clavicle fracture non-union with subclavian artery aneurysm because of the inferiorly displaced fragment might be an example to say that displaced and comminuted fractures should not be treated conservatively. Open plating does give good stability and provides early mobilisation, but we believe that slender clavicle should not be plated as it might result in stress yielding effect of the plate thereby making the plate thereby making the bone much more thinner and prone for refracture after the implant removal. We suggest, in clavicle fractures where bone is thin and slender, intramedullary fixation should be tried. Implant does stand out subcutaneously over a period of 6 months and we did have patients complaining about undue prominence of the plate and the cosmetic disfigurement.



**Fig 2:** Allman group I fracture



**Fig 3:** Check x ray of superior reconstruction plating



**Fig 4:** postoperative check X-ray after superior reconstruction plating

and restores the biomechanics of the shoulder joint at a early stage. Existing complications are negligible and does provide good stability and early pain free shoulder to the patient. Only in cases where clacicle is thin and slender we believe intramedullary fixation should be tried to avoid stress yielding effect of plates.

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### Conclusion

open reduction and internal fixation with plating for clavicle fractures provides better clinical and radiological outcome