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A comparative study of functional outcome of clavicular fractures treated by operative and non- operative methods

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Abstract

Clavicular fracture is one of the most common injuries of the skeleton, representing 3% to 5% of all fractures and 45% of shoulder injuries. Midshaft fractures have traditionally been treated non-operatively. Prevalence of non-union or mal-union in displaced midshaft clavicular fractures after conservative treatment is higher than previously presumed and fixation methods have evolved. Surgery is accepted as primary treatment for displaced midshaft clavicular fractures. Majority of the cases were due to RTA 29 cases and 11 cases were due to fall. The mean time of fracture healing was shorter in the operative group (15.1 weeks) than non operative group (20 weeks). The difference is statistically highly significant ($P < 0.001$). There was no non union in the operative group and 15% non-union in the non-operative group. A significant difference between the two groups in terms of DASH and Constant Shoulder Scores after the six months follow up was not found. Operative fixation of the clavicle fractures results in improved function, shorter time for union and early return to activity compared with non-operative treatment. Primary operative intervention in clavicle fracture in active adults may be of immense importance.

Keywords: Clavicle fractures, operative, non-operative, comparative study

Introduction

Clavicular fracture is one of the most common bony injuries. They account for 2.6% to 4% of adult fractures and 35% of injuries to the shoulder girdle. The clavicle is an S-shaped bone that acts as a strut between the sternum and the glenohumeral joint. It also has a suspensory function to the shoulder girdle. The shoulder hangs from the clavicle by the coracoclavicular ligament. The most commonly used system of classification of clavicular fractures is that of Allman. It is divided into 3 groups^[1].

Middle-third fractures.

Group II: Lateral-third fractures.

Group III: Medial- third fractures.

We have taken up this study to gain a deeper understanding of results and problems associated with functional outcome of clavicle fractures treated by operative and non-operative methods^[2].

Similar study of middle third clavicle fractures was done by Mohsen khrami *et al* who treated 65 middle third clavicle fractures with both operative and conservative method^[11] and Aruljothi Vaithilingam *et al* who treated 30 clavicle fractures with both operative and conservative method^[12].

Material and methods

It is a prospective study which was carried out from November 2013 to November 2015 in Kempegowda Institute of Medical Sciences, Bangalore. In this study period 40 cases of midshaft clavicle fractures, meeting the inclusion and exclusion criteria were treated by operative and non-operative methods.

Inclusion criteria

1. Age >18years.
2. Middle 1/3rd fractures.

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3. Displaced and Communitated fractures
4. Fresh fractures.
5. Open fractures Type1 and 2 according to gustilo anderson classification.

Absolute indication for surgery

1. Impending neurovascular injury.
2. Tenting of skin.
3. Bilateral clavicular fracture.
4. Displacement >2cm
5. Shortening >2cm

Operative group

Surgery was done under general anesthesia.

Clavicle LCP was used in all cases.

Suture removed at 10-12 days.

Regular follow up was done at 3 weeks, 6 weeks, 12 weeks, 24 weeks.

Local examination of the affected clavicle for tenderness, instability deformity and shoulder movements were assessed.

Patients were followed and assessed for following factors:

- Time taken for functional recovery.
- Time taken for fracture healing (radio graphically judged by obliteration of fracture site by cortical bridging).
- Range of motion of the shoulder joints.
- Any specific complications.
- Disability of the Arm, Shoulder and Hand (DASH) score.

- The functional outcome were assessed by Constant and Murley score.

Non operative group

Patients were managed with clavicle brace and arm pouch for 4 weeks.

Active shoulder movements were initiated between 4-6 weeks based on the patient compliance.

Full range of motion was permitted after 6- 8 weeks.

Return to full activities at 3 months.

Follow up

Regular follow up was done at 3 weeks, 6 weeks, 12 weeks, 24 weeks.

Local examination of the affected clavicle for tenderness, instability deformity and shoulder movements were assessed.

Patients were followed and assessed for following factors:

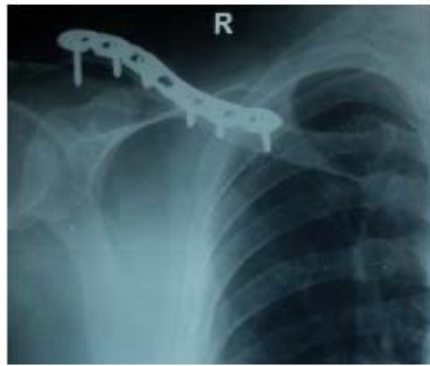
- Time taken for functional recovery.
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- Any specific complications.
- Disability of the Arm, Shoulder and Hand (DASH) score.
- The functional outcome were assessed by Constant and Murley score.



PRE OP XRAY



IMMEDIATE POST OP XRAY



3 MONTHS FOLLOW UP



6 MONTHS FOLLOW UP

**Clinical photographs
Illustration 1**



PRE OP X-RAY



IMMEDIATE POST OP X-RAY



3 MONTHS FOLLOW UP



6 MONTHS FOLLOW UP

Illustration 2



POST INJURY



6 WEEKS FOLLOW UP



24 WEEKS FOLLOW UP

Illustration 3



Illustration 4

Results and Discussion

Traditionally, clavicular fractures have been treated nonoperatively. In the 1960s, Neer and Rowe reported on the nonoperative treatment of clavicular fractures. Neer reported nonunion in only three of 2235 patients with middlethird fractures treated by closed methods [3], while Rowe reported nonunion in four of 566 clavicular fractures [4]. This information dominated the clinical approach to displaced clavicular fractures. These studies also suggested a higher nonunion rate with operative care. However, more recent studies have shown that the union rate for displaced midshaft fractures of the clavicle may not be as favorable as once thought. In a prospective, observational cohort study, Robinson *et al.* described a consecutive series of 868 patients with clavicular fractures, 581 of whom had a midshaft diaphyseal fracture [5].

They found a significantly higher nonunion rate (21%) for the displaced, comminuted midshaft fractures ($p < 0.05$). Brinker *et al.* analyzed the data in that study and suggested a nonunion rate ranging between 20% and 33% for displaced, comminuted fractures in males [6]. Similarly, in a study of fifty-two displaced midshaft clavicular fractures, Hill *et al.* reported that eight patients had a nonunion and sixteen patients had an unsatisfactory outcome on the basis of patient-oriented measures [7]. They concluded that displacement of the fracture fragments by >2 cm was associated with an unsatisfactory result [8].

Previously, malunion of the clavicle (which is typical with displaced fractures) was thought to be of radiographic interest only and required no treatment.

However, it is becoming increasingly apparent that clavicular malunion is a distinct clinical entity with radiographic, orthopaedic, neurologic, and cosmetic features. Nowak *et al.* examined the late sequelae in 208 adult patients with clavicular fractures and found that, ten years after the injury, ninety-six patients (46%) still had symptoms despite the fact that only fifteen (7%) had a nonunion [9].

The present study of middle third clavicle fractures is compared with Mohsen khrami *et al* study who treated 65 middle third clavicle fractures with both operative and conservative method [12], and Aruljothi Vaithilingam *et al* study who treated 30 clavicle fractures with both operative and conservative method [11].

In the present study mode of injury was majority due to road traffic accident 12 patients (60%) in operative group and 17 patients (85%) in non operative group and due to fall 8 patients (40%) in operative group and 3 patients(15%) in the non operative group.

In the present study mean age of the patient was 35 years and youngest being 19 years. Male predominance can be drawn

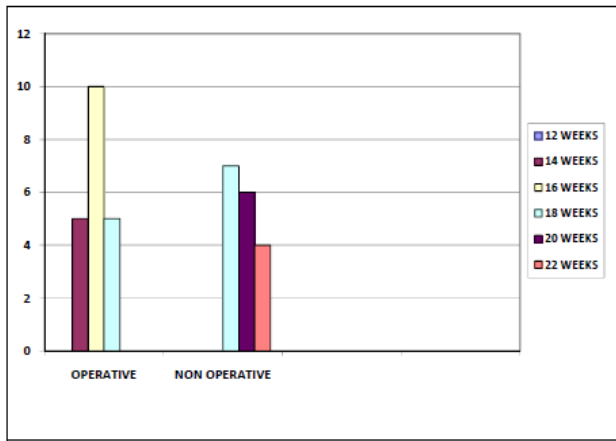
from this inference.

In present study there were 10 patients (50 %) of Left sided fracture in operative group and 9 patients (45%) in the non operative group and 9 patients(45%) of right sided fractures in operative group and 11 patients(55%) in the non operative group [10]. 1patient (5%) had bilateral clavicle fracture in operative group. Right sided fracture predominance can be drawn from this inference.

In present study Type-2 middle third fracture type-2 A1 (undisplaced) occurred in 4 patients (10%) in the non-operative group, type-2 A2 (angulated) occurred in 2 patients (5%) in the operative group, type-2 B (displaced) occurred in 7 patients (35%) in the operative group and 10 patients (50%) in the non-operative group and type-2 B1 (simple or single butterfly fragment) occurred in 11 patients (55%) in the operative group and 6 patients (30%) in the non-operative group. In the present study all the fractures where closed fractures.

In the present study the average union time in our study for operative group was 15.1 weeks and average union time for conservative group was 20 weeks. The difference is statically highly significant ($P < 0.001$).

TIME OF UNION IN WEEKS	Study groups		Total
	Operative	Non-operative	
12	0	0	0
14	5	0	5
16	10	0	10
18	5	7	12
20	0	6	6
22	0	4	4
Total	20	17	36



In the present study 3 patients (15%) in the non-operative group developed non-union.

Patients in the operative group improved functionally and returned to normal activities earlier than non-operative group. This factor is very important as patients today are more active and expect to return to pain free function following a fracture. Complications in the operative group was seen in 1 patient with implant failure after 6 months of surgery. Patient had history of fall. Patient underwent revision surgery with bone grafting. 1 patient had plate prominence and hypertrophic skin scar.

In non-operative treatment mal union was seen in 3 patients and patients were advised surgery but patients did not agree for surgery.

No infection was seen in the operative group. All surgical wounds healed between 10-12 postoperative days.

	Types	No Of Cases	%
Minor	Non Union	3	15%
	Mal Union	3	15%

In our study 3 patients (15%) had non union and 3 patients (15%) had mal union.

Complications
Operative group

	Types	No Of Cases	%
Minor	Hypertrophic Skin Scar	1	5
	Plate Prominence	1	5
	Non Union	1	5
	Shoulder Movements Restriction	1	5
Major	Plate Breakage	1	5

In our study 1 patients (5 %) had hypertrophic skin scar and plate prominence and 1 patient (5%) had non-union and plate breakage occurred.

Conclusion

In conclusion, our study shows that early primary plate fixation of midshaft clavicle fractures results in improved patient-oriented outcomes, improved surgeon-oriented outcomes, earlier return to function, and decreased rates of nonunion and malunion.

There were no catastrophic complications in the operative group such as brachial plexus palsy, vascular injury, or pneumothorax; hardware removal was the most common reason for reintervention.

Patients were more satisfied with the shoulder movements and its Appearance following operative intervention. While we

stress that our findings are applicable only to a specific subset of clavicular injuries, our data support primary plate fixation of displaced midshaft clavicular fractures in active adults.

Summary

Fourty cases of midshaft clavicle fractures, meeting the inclusion and exclusion criteria were treated by operative and non-operative methods. All the patients in the operative group underwent surgery under general anesthesia. All the patients in the operative group were mobilized with active shoulder movements and pendulum exercises by 3 weeks. All the patients in the conservative group were managed with clavicle brace and arm pouch for 4 weeks. Active shoulder movements were initiated by 4-6 weeks depending on the patient compliance.

A significant difference between the two groups in terms of DASH and Constant Shoulder Scores after the six months follow up was not found.

Patients were more satisfied with the shoulder movements and its Appearance following operative intervention. While we stress that our findings are applicable only to a specific subset of clavicular injuries, our data support primary plate fixation of displaced midshaft clavicular fractures in active adults.

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