

A Comparative Study of Functional Outcome of Clavicular Fractures Treated By Operative and Non Operative Methods.

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ABSTRACT

Background: 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. **Methods:** In this study period 40 cases of midshaft clavicle fractures, meeting the inclusion and exclusion criteria were treated by operative and non-operative methods. Majority of the cases were due to RTA that is 29 cases and 11 cases were due to fall. **Results:** 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 Constant Shoulder Scores after the six months follow up was not found. **Conclusion:** 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 fracture, operative versus conservative management, Constant Shoulder Score, internal fixation.

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.^[11,12]

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MATERIALS AND METHODS

The present study was carried out from June 2014 to June 2017 at Department of Orthopaedics, ChalmedaAnandRao Institute of Medical sciences, Karimnagar, India. During this period 40 patients of clavicle mid shaft fractures were treated surgically and conservatively.

All the patients with age above 18 years, with comminuted or displaced fractures are included in the study. Closed fresh fractures in the middle third region, open fractures of grade 1 and 2 are included and grade 3 open fractures are excluded from the study.

Patients under the age of 18 and fractures in the medial and lateral third are excluded from the study. Pathological fractures are also excluded from the study. Fractures with associated

acromioclavicular joint dislocations are excluded from the study.

The patients are divided randomly in to operative and conservative group. The absolute indications for surgery in operative group are impending neurovascular injury, tenting of skin due to fracture, bilateral clavicular fracture, displacement of fracture fragments >2cm, and shortening >2cm
Operative group: Surgery was done under general anesthesia. Clavicle precontoured LCP was used in all cases. Sutures removed at 10-12 days. Active range of shoulder movements and pendulum exercises were initiated at 3 weeks. After 6 weeks and depending on the clinical and radiological evidence of fracture healing shoulder strengthening exercises were allowed. Regular follow up was done at 3 weeks, 6 weeks, 12 weeks and 24 weeks. Local examination of the affected clavicle for tenderness, instability, deformity and shoulder movements was assessed.

Patients were followed and assessed for following factors: Time taken for functional recovery, time taken for fracture healing (radiographically judged by obliteration of fracture site by cortical bridging), range of motion of the shoulder joints, any specific complications. The functional outcome was assessed by Constant and Murley score.

Constant and Morley Scoring

The patients are graded as follows

Category

A) Subjective:	Pain
1) No Pain 15 points	
Mild pain	10
Moderate pain	5
Disabling pain	0
2) Activities of daily living: - 20 Points	
Ability to perform full work	04
Ability to perform Leisure activities/ Sports	04
Unaffected sleep	02
B) Range Of Movements: 40 Points:	
a) Active flexion without pain	
00 – 30 degrees	00
31-60 degrees	2
61-90 degrees	4
91-120 degrees	6
121-150 degrees	8
> 151 degrees	10
b) Functional external rotation:	
Hand behind head with elbow forwards	2
Hand behind head with elbow backwards	4
Hand above head with elbow forwards	6
c) Active abduction without pain: With dorsum of hand on back, head of third metacarpal reaches	
00 – 30 degrees	00
31-60 degrees	2
61-90 degrees	4
91-120 degrees	6
121-150 degrees	8

> 151 degrees	10
d) Functional internal rotation:	
Ipsilateral buttock	2
S1 spinous process	4
L3 spinous process	6
T12 spinous process	8
T7 spinous process	10
e) Strength of abduction : 25 Points	
Total score	Result
90- 100	Excellent
80 – 89	Good
70 – 79	Fair
0 – 70	Poor

A normal shoulder in a 25 year old man resists 25 pounds without difficulty. The score given for normal power is 25 points, with proportionately less for less power.

Patients were graded as below with a maximum of 100 points.

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. Patients were followed and assessed for the same factors as in operative group.

RESULTS

This is a prospective comparative study, comparing the functional outcome of patients with clavicular fractures, managed with conservative management and surgical management. 40 patients are included in the study, out of which 20 patients are managed conservatively and 20 patients are managed operatively. 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. 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] 1 patient (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 were closed fractures. In the present study the average union time in our study for operative group was 15.1 weeks [Figure 2] and average union time for conservative group was 20 weeks. The difference is statically highly significant (P<0.001).

Table 1: Comparison between 2 groups in rate of union.

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.

Table 2: The functional outcome is assessed by Constant and Murley Score.

Results	Study Groups		Total
	Operative	Non Operative	
Excellent	9	6	15
Good	10	13	23
Fair	1	1	2
Poor	0	0	0
Total	20	20	40

Complications
Non – operative group

Table 3: Complications in non-operative group.

Types	No.Cases	%
Non Union	3	15%
Malunion	3	15%

Table 4: Complications inoperative group.

Types	No Of Cases	%
Hypertrophic Skin Scar	1	5
Plate Prominence	1	5
Shoulder Movement Reaction	1	5
Plate Breakage	1	5

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

Operative group:

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



Figure 1: Patient managed with conservative management showing malunion at the fracture site and bony lump.

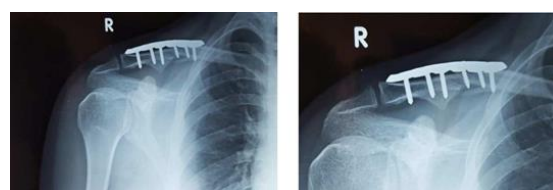


Figure 2: Post op image at 1 and 2 months follow-up showing good alignment of bone and union.

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 (more than 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 [Figure 1]. 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 that treated 65 middle third clavicle fractures with both operative and conservative method and Aruljothi Vaithilingam et al study who treated 30 clavicle fractures with both operative and conservative method.^[11,12]

In the present study mode of injury was majority due to road traffic accident in 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. The incidence is same as that of Mohsen khrami et al study in which clavicular fracture due to RTA is seen in 70% of patients and Aruljothi Vaithilingam study in which clavicle fractures due to RTA is seen in 65% of cases.

Young active patients are more involved in clavicle fractures. In our study the mean age of the patient was 35 years and youngest being 19 years. In Mohsen khrami et al study mean age of the patient was 31 years. In Aruljothi Vaithilingam et al study mean age of the patient was 32.90 years.

In our 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 ($P < 0.001$). In Mohsen khrami et al study the average union time was 19.3 weeks for operative group and 24.4 weeks for non-operative group ($P = 0.006$). In Aruljothi Vaithilingam et al study the average union time was 15.73 in operative group and 27.47 weeks for non-operative group. The difference is statically highly significant ($P < 0.0001$). Our results are comparable with the above study that union rates is better in operative group than that of the non-operative group. None of the patients in our study in the operative group had non-union and 3 patients (15%) in the non-operative group developed nonunion. In Mohsenkhrami et al study 2 patients (5.7%) in the operative group and 4 patients (13.3%) in the non-operative group developed nonunion. ($P = 0.518$).¹⁴ Our results are comparable with the above study that non-union is higher in non-operative group than that of the operative group.

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 were 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.

None of our operated patients developed any neurovascular injury. None of the patients in this study had pulmonary injury either following primary injury or iatrogenically.

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.

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