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Original Article

Fracture Clavicle: Is Surgical Fixation a Better Treatment?

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Abstract

Background: Fractures of clavicle represent approximately 3–12% of all fractures treated by orthopedic surgeons. There has been a debate over the years for the best treatment of midshaft clavicle fractures. Our study is intended to find both conceptual and practical guidance for precision treatment with an expectant favorable functional result.

Materials and Methods: Out of 50 patients of clavicle fractures, 25 were treated conservatively and 25 were treated operatively by locking plate fixation. Outcomes were assessed using the disabilities of the arm, shoulder and hand (DASH) score for functional assessment.

Results: Functional and anatomical outcomes were found to be better in patients treated operatively with better DASH scores compared to patients treated with clavicle brace and sling.

Conclusion: Surgical fixation of fracture clavicle gives better functional outcomes and shorter time for union with better anatomical reduction than non-operative treatment. Hence, we recommend surgical fixation with a locking plate is the standard of treatment in these fractures.

Key words: Conservative treatment, Fracture clavicle, Plate fixation

INTRODUCTION

In today's era of metallurgy and fast life, the increasing incidence of clavicle fractures due to road traffic accidents accounting to 94%.[1] More emphasis is being given in the management of these fractures, which brings about the debate of whether clavicle midshaft fractures treated operatively yield better results compared to traditional conservative management. It is one of the most common fractures accounting for 3–12% of all fractures and 45–65% fractures around the shoulder.[2] Midshaft fracture commonly occurs in young adult, whereas lateral and medial end clavicle fracture is more common in the elderly.[3,4] The most commonly used non-operative method is clavicle brace and an arm sling, it has the advantage of being non-invasive and absence of exposure to anesthesia. However, non-operative methods are said to be associated with risk of non-union, residual deformity, and patient dissatisfaction. Most clavicular fractures still are treated closed and heal uneventfully without serious consequences.[5] It is becoming increasingly apparent that clavicular malunion is a distinct clinical entity with radiographic, orthopedic, neurologic, and cosmetic features. Increasing reports of complications associated with non-operative management such as symptomatic malunion, nonunion, shortening, and droopy shoulder, have stirred toward operative management of clavicle fractures. Internal fixation restores the anatomical continuity of the clavicle, early return to functional activity, the shorter period of immobilization, and less complications.[6-11] Therefore, this study was conducted to analyze the outcome of management of non-operative and operative procedures in fracture clavicle and discover whether operative treatment is superior to conservative management. There are various studies conducted in other countries to compare the outcome between surgical and

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conservative management in the treatment of clavicle fractures, but studies in India are less.

MATERIALS AND METHODS

This study is carried out on the patients with fractures of clavicle [collar bone], admitted, and treated in CIMS Medical College and Hospital, Bilaspur, Chhattisgarh from 2016 to 2018. Fifty patients with fractures of clavicle were included in the study, of which 25 cases were treated conservatively and 25 cases were treated operatively. On arrival of patient detailed history, age, sex, mode of injury, days since injury, associated injuries, and underlying medical conditions were noted carefully. The patients were assessed clinically and radiologically. Routine necessary hematological pre-surgical investigations were done and surgery was performed in the operative group after pre-anesthetic fitness.

Inclusion Criteria

Patients above the age of 18 years with fracture of the clavicle were included in the study.

Exclusion Criteria

Pathological fractures, compound fractures, with associated head injury patients, and with medical contraindication for anesthesia and surgery were excluded from the study.

Twenty-five patients of the non-operative group were treated with a commercial clavicle brace and traditional cuff and collar sling. While 25 patients of the operative group were operated by a superior approach to clavicle in beach chair position, the fracture was fixed with pre-contoured S-shaped anatomical locking plate. We excluded terminal, lateral end clavicle fractures where pre-contoured S-shaped anatomical locking plate fixation was not possible.

Pendulum exercises of the affected shoulder started after 10–15 days as and when tolerated, along with elbow range of motion exercises. The patients were asked not to stop their wrist and hand movements soon after the start of treatment. From 6 weeks, onward resistive exercises were encouraged after removal of the brace.

Follow-up

After 3 days postoperatively, with the completion of intravenous antibiotics course, patients were discharged. Later, the follow-up was after 2 weeks, 6, 12, 18, and 24 weeks, respectively (the follow-up protocol was the same for both groups). They were assessed for any wound dehiscence, radiological assessment for fracture healing, range of motion of shoulder joint, DASH score, and any other specific complaints.

All the patients were motivated for physiotherapy and range of motion exercises in every follow-up.

RESULTS

There were 43 males and seven females in our study, the mean age in males was 33.4 years and in females was 32 years. The maximum number of patients was among 21–30 years age group suggestive of more outdoor activities of male patients.

The maximum number of cases was due to road traffic accidents 76%, followed by self-fall 14% and physical assault 10%.

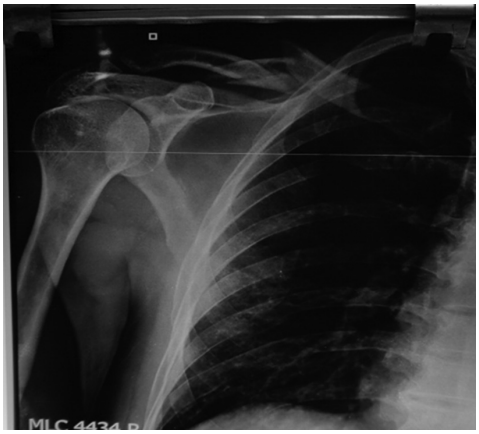
Fracture Healing (Radiological Union)

The mean time of fracture union was shorter in the operative group 15.44 ± 3.24 weeks than non-operative group 21.95 ± 3.26 weeks. There is a significant difference in the time of fracture healing among both groups.

Functional Recovery

Based on the disabilities of the arm, shoulder and hand score (DASH score) operative group of patients had better functional outcomes with the mean score of 14 ± 21.3, suggesting positive results. While in non-operative group, the mean score is 54 ± 18.27.

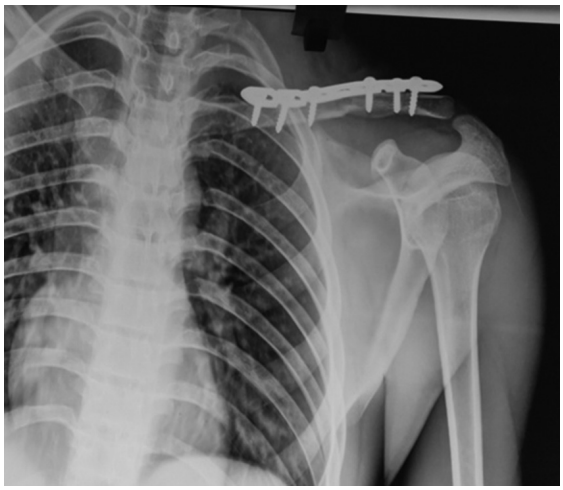
Case No. 1: Comminuted Fracture



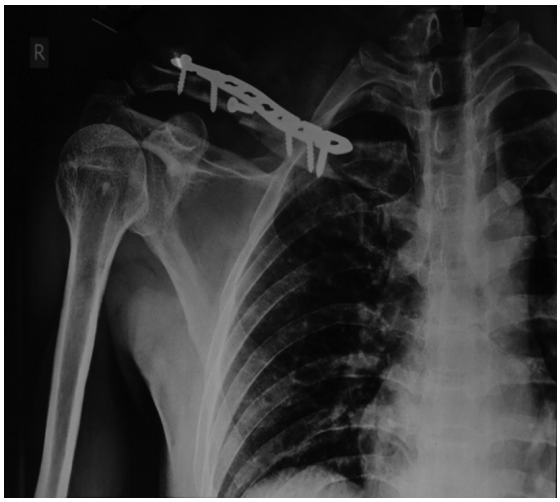
Pre-operative X-ray

Intra-operative reduction with K-wire

Post operative X-ray

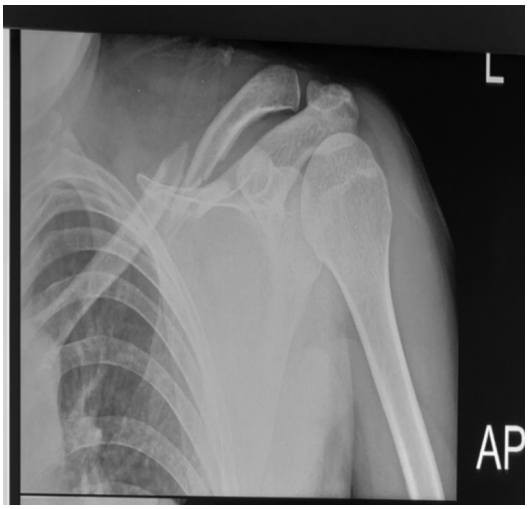


Post-operative X-ray



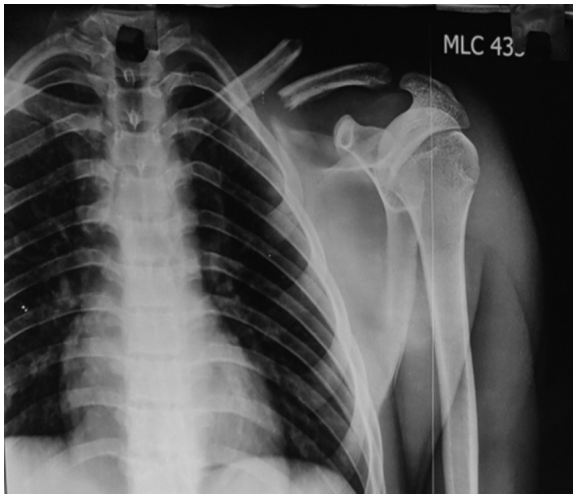
Post-operative X-ray

Case No. 3: Failed Case

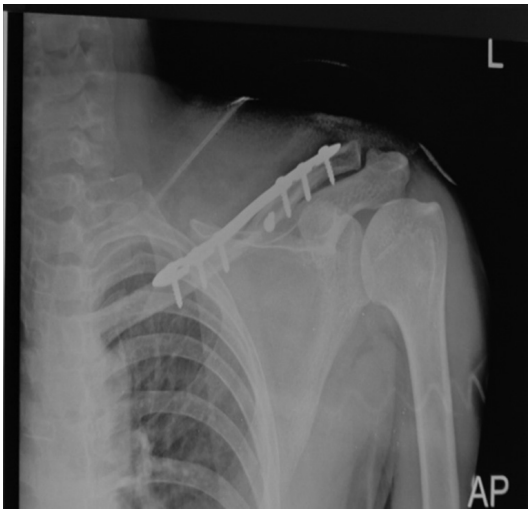


Pre-operative X-ray

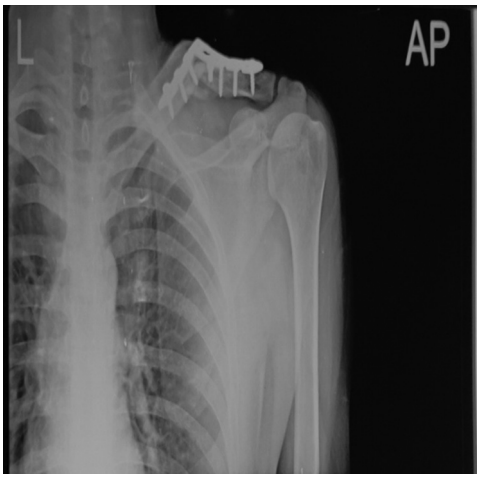
Case No. 2: Transverse Fracture



Pre-operative X-ray



Post-operative X-ray



Implant failure after 25 days postoperatively as the patient lifted heavy weight

Post-operative clinical pictures with a full range of shoulder movement

DISCUSSION

Fracture clavicle is the most common fracture of the shoulder. Since centuries clavicle fractures were usually treated conservatively because of the high rate of union, therefore surgical treatment for primary clavicle fractures was avoided. However, with the growing rise of patients' demands with modern fast paced life, the modality of treatment for displaced fracture clavicle is shifting from conservative to operative, resulting into gradual decrease in complications of non-union, malunion, stiffness, and persistent pain around the shoulder due to non-operative management.

In our study, among 50 patients, there were 43 (86%) males and seven (14%) females with the mean age in males was 33.4 ± 11.97 years and in females was 32 ± 10.39 years, which is comparable to Pearson *et al* [Table 1].[12] The youngest patient was 18-year male and the oldest patient was 65-year male. The maximum number of patients was among 21–30 years age group suggestive of more outdoor activities of male patients. Postacchini *et al.* reported male predominance (68%) in their study.[13]

A road traffic accident is the most common mode of injury in our study, constituting 76% of patients, which is comparable to Zlowodzki *et al.* and Mckee *et al.*,[14-16] followed by self fall 14% and physical assault 5% [Table 2]. Among self-fall cases, females were dominant, while males were dominant among RTA's.

The middle one-third clavicle fracture is most common in our study, cumulating 86% patients followed by lateral third 12% and then medial third fracture 2%, which is comparable to the study of Vaithilingam *et al* [Table 3].[17]

In our study, we treated most of the undisplaced to minimally displaced oblique fracture 48% conservatively by clavicle brace and cuff and collar sling, followed by transverse fracture 8% and comminuted fracture 5%. Moreover, we operated most of the comminuted fracture patients 48%, followed by oblique fracture 32% and transverse fracture 5% [Table 4]. We found out that operating comminuted middle third clavicle fracture gives excellent recovery and functional results; also, it reduces the chances of lung injury if treated surgically.

The patient satisfaction in the operative group of patients was higher than the non-operative group as their complaint of pain was less than 50% the next day postoperatively. Their confidence in performing day to day activities was also higher than the non-operative group. They return to normal activity much early than the non-operative group. Based on DASH score operative group of patients had better functional outcomes with the mean score of 14 ± 21.3, suggesting early functional recovery. While in non-operative group, the mean score is 54 ± 18.27.[17,18]

The mean time of radiological fracture union was shorter in operative group 15.44 ± 3.24 weeks than non-operative group 21.95 ± 3.26 weeks, suggestive of significant difference in the time of fracture healing among both groups, which is comparable to Mckee *et al.*, Judd *et al.*, and Vaithilingam *et al.*[15-17]

Table 1: Age and sex distribution

Age in years	Male Number of cases (%)	Female Number of cases (%)	Total Number of cases (%)
<20	3 (6.97)	0	3 (6)
21–30	20 (46.51)	3 (42.85)	23 (46)
31–40	9 (20.93)	4 (57.14)	13 (26)
41–50	5 (11.62)	0	5 (10)
51–60	5 (11.62)	0	5 (10)
>60	1 (2.32)	0	1 (2)
Total	43 (86)	7 (14)	50 (100)
Mean±SD	33.4±11.97	32±10.39	33.26±11.20

Table 2: Mode of trauma (Overall cases)

Mode of trauma	No. of cases (%)
FALL	07 (14)
RTA	38 (76)
Physical assault	5 (10)
Total	50 (100)

Table 3: Fracture type (overall cases)

Middle third	43 (86)
Lateral third	06 (12)
Medial third	01 (2)
Total	50 (100)

Table 4: Pattern of fracture

Pattern of fracture	Management		Total	%
	Conservative (%)	Operative (%)		
Comminuted	5 (20)	12 (48)	17	34
Oblique	12 (48)	8 (32)	20	40
Transverse	8 (32)	5 (20)	13	26
Total	25	25	50	100

Table 5: Complications

Complications	Conservative		Operative	
	Number of cases	%	Number of cases	%
Non-union	4	16	-	
Malunion	16	64	-	
Pressure sore	1	4	-	
Incisional numbness	-		1	4
Implant failure	-		1	4
Implant irritation	-		1	4

The complications were more in non-operative group [Table 5]. Malunion is the most common complication in non-operative group 64% followed by non-union 16%[15,19] and there was one case of pressure sore over the shoulder due to tight bandaging of clavicle brace in non-operative group which was healed after proper padding, local dressing, and a course of antibiotics. Furthermore, the patients complained of visible deformity with shortening of the shoulder and unable to perform the terminal range of shoulder movements in non-operative group. In 24% of cases treated conservatively, we observed that the shoulder abduction was not beyond 90 degrees.

In operative group, there was one case of incisional numbness postoperatively, which was gradually subsided in routine follow-ups and with a course of steroids. There was one case of implant failure, as the patient was non-compliant and alcoholic and lifted heavyweight 25 days after surgery. Moreover, one patient complained of implant irritation 24 weeks after surgery, for which the implant was removed as the fracture was healed completely [Table 5].[17] Rest all the cases achieved a full range of shoulder movements.

We have not observed any case of infection, iatrogenic injury to subclavian vessels, pleural injury, and brachial plexus injury, as these vital structures are around the surgical field.[10,11,20-22]

CONCLUSION

From our study, we concluded, surgical fixation of clavicle fracture provides excellent results with better cosmetic and functional outcome, lesser time of fracture healing, with early return to daily activities and with better patient satisfaction, than by conservative means. We suggest that operative treatment of fracture clavicle has the upper hand over traditional conservative management; also, the treatment must be individualized as per the need and demand of the patient.

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