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Research Article

Comparative study between operating and non-operating management in patient with mid shaft clavicle Fractures

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ABSTRACT

Background & Objectives: Clavicle is one of the common fractures around 4% of total fracture encountered. Road traffic accident as well as fall injury and sports activities result to clavicle fracture. The trauma resulting to clavicle fracture mostly occurred at middle shaft of the clavicle. Treatment modalities should be done for clavicle fracture on all factors that include union, complications, costs, cosmetic and functional outcome. Thus, this prospective study was aimed for comparing the bone union duration, functional outcome, patient satisfaction and never the less the complications seen from both mode of treatment of clavicle fracture

Material and Methods: Patient with complete displaced mid-shaft clavicle fractures at emergency and orthopedics department of Janaki medical College and Teaching Hospital from February 2021 to November 2022 were selected for this prospective research. After fulfilling the inclusion criteria, the patients were divided into two groups randomly, with 30 cases in each group of operating and non-operating.

Results: This study showed operating group has better outcome and less complication compared with non-operating group in aspect of non-union, mal-union and functional issues. Mean fracture union time in follow-up was noticed as 3.21 months and 4.38 months in operative and non-operative group respectively. The mean Constant shoulder score was 91.3 for operating group. The mean DASH score after was 8.9 operating group. The mean constant shoulder score and DASH score were 77.4 and 23.3 in non-operating group. The P-values for DASH and Constant shoulder score were less than 0.001 which is statically significant. There were few complications in operating group like hypertrophic scar, implant

failure and infection. There were significant benefits of operating mid-shaft clavicle fracture over non-operating group.

Conclusion: Open reduction and internal fixation of mid-shaft clavicle fracture is an effective treatment. This method has a higher satisfaction rate than conservative treatment.

Keywords: Clavicle Fracture, Plating, Mid-shaft

INTRODUCTION

Clavicle is one of the common fractures around 4% of total fracture encountered [1, 2]. The trauma resulting to clavicle fracture mostly occurred at middle shaft of the clavicle. Road traffic accident as well as fall injury and sports activities results to clavicle fracture[3]. Treatment of the middle shaft clavicle fracture have different opinions. At present it is still conservative management regarded as standard treatment for clavicle fractures [4]. But sometimes there may be absolute indication of surgery in case of open fractures, multiple trauma or any neurovascular conditions [3, 5].

Although nowadays operative management has been in priority by many surgeons that is due to its early rehabilitation, early union and for cosmetic issues. Treatment modalities should be done for clavicle fracture on all factors that include union, complications, costs, cosmetic and functional outcome. Although in rural based patient conservative management is priority but in urban due to workload, socio-economic status and cosmetic issues operative treatment is more preferred by patients. Many studies have done for the difference in operative and non-operative management for clavicle fracture, but still there is controversy regarding its choice of treatment [6-9].

In this prospective study there has been study done for comparing the bone union duration, functional outcome, patient satisfaction and never the less the complications seen from both mode of treatment of clavicle fracture. This prospective randomized controlled study was done to show that operative management method has better outcome. Allman Classification focused on 3 types of clavicle fracture

-Middle third (70-80%)
-Lateral third (12-15%)
-Medial third (5-8%)

Middle third clavicle fracture were the cases taken for the study. Intramedullary devices, External fixators and plates are the choice for operative management of clavicle fractures[10]. Plating cases were only included in these cases to minimize the bias in the case studies. Open reduction and internal fixation with plates and screws is the preferred option and first choice for surgical management. This study was focused on comparative study between operating and non-operating management in patient with mid shaft clavicle fractures.

MATERIALS AND METHODS

In this prospective study, patients with complete displaced mid-shaft clavicle fractures at emergency and orthopedics department of Janaki medical College and Teaching Hospital from February 2021 to November 2022 were selected for this prospective research. Ethical approval prior to this research was obtained from Institutional Review Committee of Janaki Medical College. Informed consent was obtained from all the participants.

Inclusion Criteria

The inclusion criteria of the study follow:

- Complete displacement of middle shaft fracture with displacement distance more than 1cm.
- Age between 18 years to 50 years old.
- Injury time to intervention time with less than 72 hours.
- Participants who fully understood and agreed for the management.
- No other intervention beside the clavicle treatment.
- Average follow-up period of 6-18 months

Exclusive Criteria

-if any other surgery or treatment needed.
-Any other injury that may influence the cosmetic and functional outcome of clavicle treatment.
-Pathological Fractures

Patient were counseled regarding benefits of operative and non-operative treatment of clavicle fracture. On the basis of the patient's choice the treatment was done and were divided in groups.

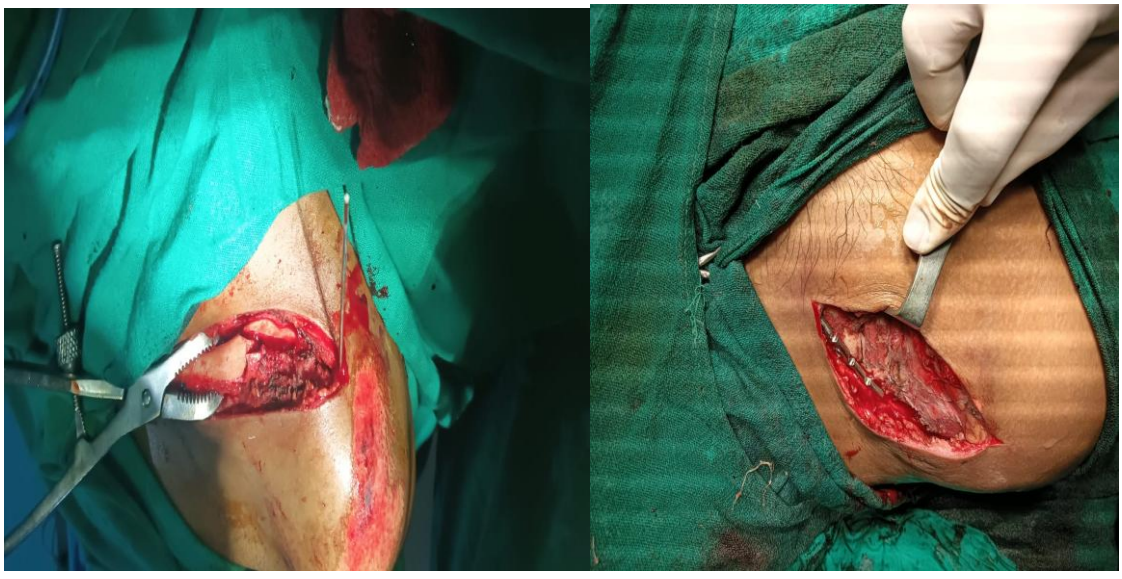
Technique of Management

Operating Technique

The operative management have surgery with open reduction and internal fixation with plates and screws. With patient consent taken and under anesthesia the skin and subcutaneous tissues were incised in layers using supraclavicular approach. The both ends of fracture was exposed with preserving cutaneous nerve. Reduction was done and fixed with clavicle locking plate and screws (figure 1a and 1b). Finally, suture was done in layers and dressing done.

Non-Operative Management

Application of figure of eight brace and sling done (figure 2a and 2b). Avoid weight lifting



1a **1b**

Figure 1: Schematic representation of surgical approach of Clavicle fracture 1a. Reduction of fracture 1b. Fixation with plates and screws.

2a 2b

Figure 2: Schematic representation of non-surgical approach of Clavicle fracture 2a. Clavicle brace application 2b. Arm sling application

and continue brace for one months with NSAIDs for pain management.

Outcome Assessment

For this study, we evaluated all patients at 6weeks to 18 months of management. Shortening was mentioned in case of 1cm less than opposite clavicle, nonunion if there is lack of breezing cortical in radiology after 6months of treatment. Complications like infection, plate breakage, plate elevation, hypertrophic scar, screw loosening were evaluated and listed in the follow-up. Both the groups have 30 patients each of which DASH score (which is patient oriented outcome scale) used for evaluation. The range of motion of shoulder was measured using orthopedic goniometric device for abduction, flexion and external rotation at 45degree abduction compared with normal side.

Each visit consists of radiological and union condition recorded. Weakness and power were assessed by patients. 60 patients were included in the study with SPSS version 22 software to analyze the results. Student's t-test was used to compare the results for the scaling systems. Chi-square test with p value of <0.05 was considered statically significant.

RESULTS

30 cases were in the operative groups and 30 cases were in non-operative groups. Both the groups have equal number of selections. The mean age of patients was 29.7 years old in operative groups and 35.6 years old in non-operative groups. 20 cases of male and 10 cases of female in operative group while in non-operating group 18 cases of male and 12 cases of female. Road traffic accident was the commonest mode of injury seen followed by sports activities.

40 cases were of RTA, while 15cases were of fall injury and 5cases of injury from sports activity. Mean fracture union time in follow-up was noticed as 3.21 months and 4.38 months in operative and non-operative group respectively (Table 1). On independent sample t-test p-value was found to be 0.021 which was statically significant.

Table 1: Data of operative and non-operative groups (mean and numbers)

	Operative group	Non operative group
Mean Age(years)	29.7	35.6
Sex (Male/Female)	20/10	18/12
Mean fracture Union time (months)	3.21	4.38

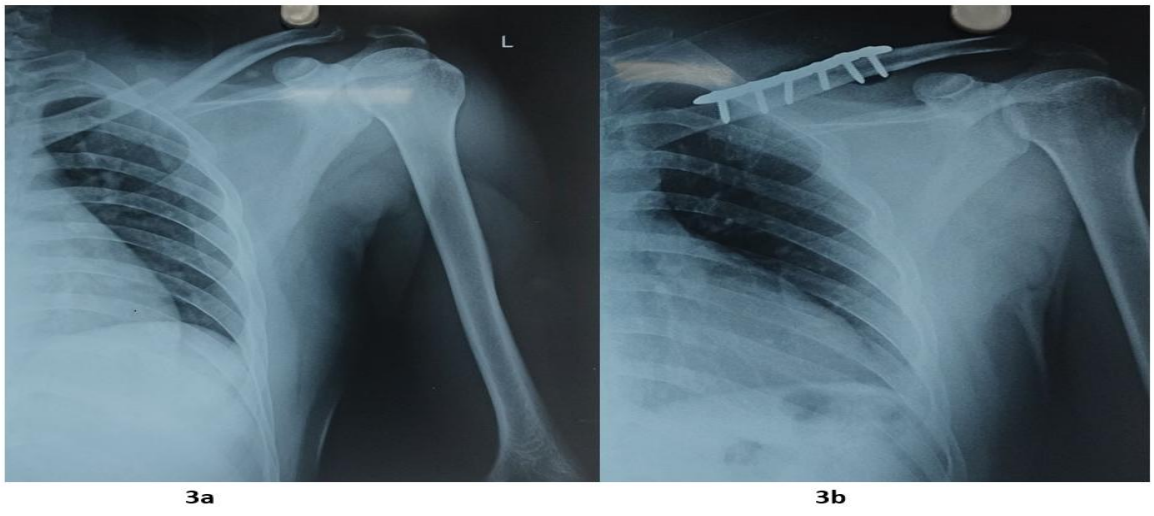
Table 2 Outcomes in operative and Non operative groups

	Operative group	Non operative group	P value
DASH	8.9	23.3	<0.001
Constant Shoulder Score	91.3	77.4	<0.001
Mean Length discrepancy(mm)	3.5	25.4	<0.001
Limitation of motion/Stiffness	1	10	<0.001
Infection	2	0	1
Implant Failure	2	0	1
Hypertrophic Scar	2	0	1
Mal-union	1	8	0.062
Non-union	1	3	1

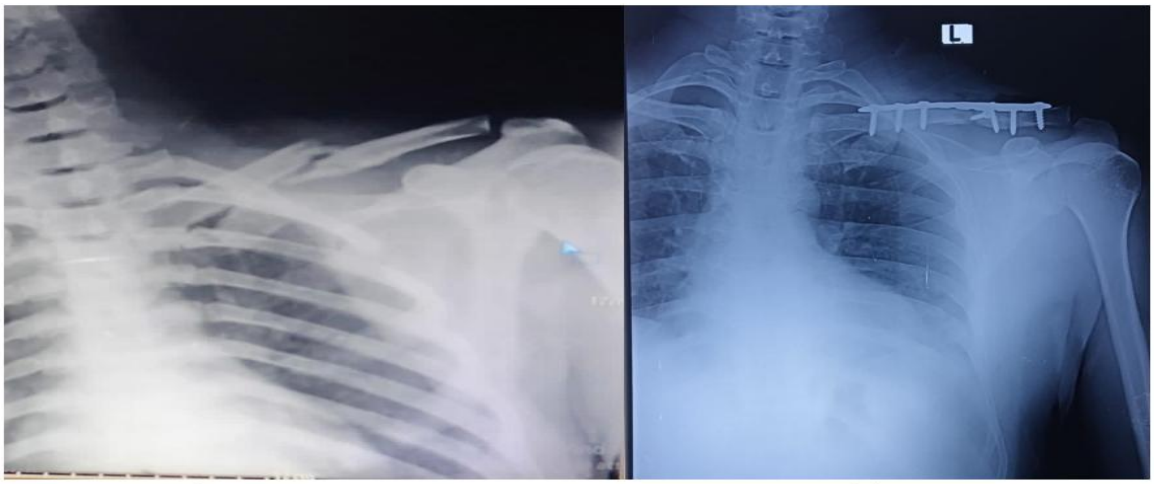
Table 3: Patient Satisfaction rate after 24 weeks of Treatment

	Operative Group	Non Operative Group
Satisfied Patients	28	11
Dissatisfied Patients	2	19
Cause of Dissatisfaction	-Hypertrophic scar -infection	-imbalance of shoulder -stiffness -non-union

There were 2 cases of infection resulting from screw loosening and was early implant removal done to prevent from occurring of osteomyelitis. 1 patient develop non-union in operating group while in there were 3 cases of non-union in non-operating group. There was 1 case of mal-union in operating groups while more cases of mal-union were seen in non-operating group i.e. 8 cases (Table 2). No any patient complaint of appearance issues or misbalanced shoulders in operating group. Range of motion of most patients were almost normal. The mean Constant shoulder score was 91.3 for operating group. The mean DASH score after was 8.9 operating group. 2 patients developed hypertrophic scar of which were dissatisfied of surgery after 6 months. Shortening of clavicle length is seen in 4 patients in non-operating group. There was shoulder imbalance compared to normal side in 3 patients in non-operating group. 10 patients have decreased external rotation and shoulder abduction in non-operating group. The mean constant shoulder score and DASH score were 77.4 and 23.3 in non-operating group. 19 patients were not satisfied with the non-operative management (Table 3).

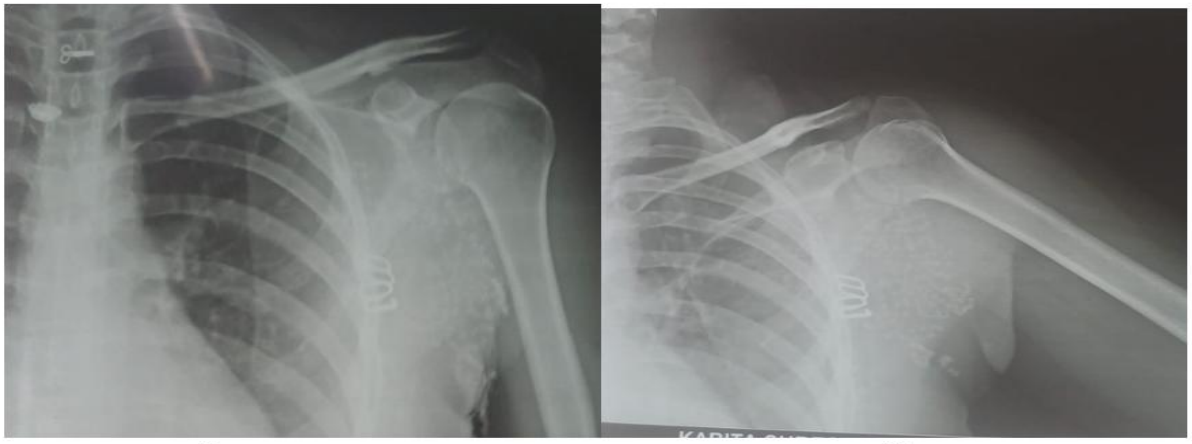


3a 3b



3c 3d

Figure 3. Radiological presentation before operating (3a and 3c) and after operating (3b and 3d) of the clavicle fracture



4a. 4b.

Figure 4. a. Radiological presentation after clavicle brace application. 4b. Radiological presentation in follow up after non-operating treatment

The P-values for DASH and CCS were less than 0.001. The cases with surgical intervention were more satisfied. More Patients lost their abduction full range in non-operative group. Complications were higher in no- operating groups. Infection, scare and numbness were more in surgical group. Length size shortening of clavicle is seen in patient of non-operative group.

DISCUSSION

Clavicle fracture in mid shaft region are normally treated non surgically. Neer's concept of conservative treatment for clavicle fracture has been shown excellent results from conservative management with less nonunion [11]. But recent studies shown that nonunion is not rare in case of clavicle fractures. Disability and limb function compromised are results from mal-union[12]. Major concerns of treatment are nonunion and cosmetic issues. In karalou et. al. results show higher union rate with conservative method. In our study there are number of non-union in non-surgical technique [13]. There has been number of authors who choose for operative option for clavicle fracture. In our study also there is significant benefit seen of operative over non operative treatment of clavicle fracture [14, 15]. Radiological and clinical assessment was done in follow up to know the function, union and the complications of the management. In

this study, we have found that surgical fixation has higher union rate, shorter union time and takes less time to resume strength, movement and working ability when compared with conservative therapy. In this study, we found that the rate of non-union in non-operative patients was significantly higher compared to operative patients, which support with previous research. In our study, complications of conservative and operative group were discussed separately. For a long time, complications of surgery like skin numbness being rarely reported[16]. Skin numbness occurs as a result of damage to the supra-clavicle and cutaneous nerves during the operation, which can occur around the surgical site or in other areas of the shoulder, but it may be caused by the bump pressure of mal-union as well [17].

The patients treated conservatively were found to have a longer duration of fracture union i.e. mean 4.38 months as compared to those treated operatively with mean 3.21 months. This was a statistically significant. It was similar to studies by Patel et al, Dhoju et al and the multicenter randomized control trial by the Canadian Orthopedic Trauma Society[18]. 19 patients in non-operating group and 28 patients in operative group expressed their satisfaction over the treatment method they chose. Most common complication in the conservative group was radiological mal-union, but since all cases had asymptomatic mal-union. Among the non-operating group treated patients mild shoulder stiffness was seen in 10 patients, while few had mild pain in extremes of motion. There were 3 cases of non-union.

The commonest complication seen in the operative group was surgical site infection seen in 2 cases. Patient had deep infection leading to screw loosening and implant failure. In this patient, the plate was removed and wound was debrided. Complications like shoulder stiffness and pain at extreme of motion were seen in 1 patient and hypertrophic scar was seen in 3 patients. Studies by Canadian Orthopedic Society, Patel et al. and Vaithilingam et al. also found higher rate of mal-union and non-union in

conservative group while study by [19, 20]. This study also showed main areas that reflect the impact on daily life and the operative group showed significant faster recovery. Nowadays, intelligent office technology has reduced reliance on the shoulder, allowing most patients with mildly limited shoulder motion to be competent for work tasks which seemed still difficult for non-operative group patients. The shorter gap between injury and returning to work give the patients competitive edge in family and society. Non-operative patients experienced shoulder imbalance and stiffness, likely due to the shortening of the affected clavicle, while operative patients showed concerned to the plate due to its prominent. The difference in time required for recovery was due to the longer immobilization and severe pain in early stage for non-operative patients.

CONCLUSION

Open reduction and internal fixation of mid-shaft clavicle fracture is an effective treatment. This method has a higher satisfaction rate than conservative treatment.

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Conflict of Interest: None declared

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Author's Contribution Conceptualized and designed the study, reviewed literatures performed data collection, statistical analysis, and manuscript drafting-**RS, ARB;** data interpretation, referencing and revision of first draft – **CMK, DNS, SS.** Final draft revision with intellectual content- **RS.** All authors read and approved the final version of the manuscript prior to submission.

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