

**ORIGINAL RESEARCH**

# Comparison of conservative and surgical management with LCP of displaced mid shaft Clavicle fractures

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**ABSTRACT**

**Background:** Clavicle fractures comprise 2% of all fractures and 35–45% of all shoulder girdle injuries in adults (Nordqvist and Petersson 1994, Postacchini et al. 2002). The incidence in western countries is around 50–64 per 100 (Nordqvist and Petersson 1994, Nowak et al. 2000). Clavicle fractures are one of the most common adult injuries, accounting for 5% to 12% of all fractures and representing up to 44% of injuries to the shoulder girdle. **Aims and Objectives:** To compare Conservative versus Surgical Management with Locking Compression Plate (LCP) Of Displaced Mid Shaft Clavicle Fractures. **Materials And Methods:** This was a cross-sectional study carried out in the patients with clavicle fracture during the one-year period i.e February 2022 to January 2023 So during the one year period there were 52 patients with clavicle fracture were enrolled to study out of the 52 with the written and explained consent 26 patients were selected randomly and managed conservatively and 26 selected randomly and managed surgically by Compression Plate (LCP). The details of the patients like age, sex, site, mode of injury, alcohol influence at the time of injury, fracture pattern, average duration of the wound healing, duration of fracture healing, functional outcome and complications were noted. Follow up of patient done at 2 weeks, 6 weeks, 12 weeks and 24 weeks The statistical analysis was done by chi-square test and unpaired t-test and analyzed by SPSS 19 version software. **Results and Observations:** In our study 52 patients with clavicle fracture were enrolled to study out of the 52 with the written and explained consent 26 patients were chosen randomly & managed conservatively and remaining 26 managed surgically by Compression Plate (LCP). The average age was comparable in both the groups i.e. 42.12 ± 3.23 and 41.19 ± 4.19 (p > 0.05, t = 0.72, df = 49) and the male to female ratio was also comparable in both the groups i.e. 1.5 : 1 and 2.1 : 1 (X<sup>2</sup> = 0.347, df = 1) The average healing was significantly more in conservative management group i.e. 5 ± 3.45 months versus 2.98 ± 2.87 (p < 0.05, t = 4.76, df = 49) in operative group Complications were symptomatic Mal-union, Union with symptoms, Delayed union, Infection etc. The complications were comparable in both the groups (X<sup>2</sup> = 6.119, df = 5, p > 0.05). **Conclusion:** Clavicle fractures, conventionally treated conservatively, may lead to suboptimal outcome specifically in comminuted, displaced and shortened midshaft and lateral third clavicle fracture. Mid third clavicle fractures treated by locking plate and with anatomical reduction, achieves reliable bony union and provides amore rigid stable fixation which does not require immobilization for longer periods. It can be concluded from our study that both the methods were comparable with respect to the complications but healing was significantly faster in the surgical method of management with early return of functional activity and hence surgical management should be preferred but the management should be individualized as per the patient

**Key Words:** Surgical management, Locking Compression Plate (LCP), Clavicle fracture, conservative management, complications, clavicle plating.

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**INTRODUCTION**

Clavicle is a sigmoid shaped bone with male have thick and longer and more curved bone compare to female and left side clavicle is significantly longer than right side (21) Clavicle fracture and its conservative treatment in Egyptian era is well

documented (Breasted JH University of Chicago Press Chicago- The Edwin Smith Surgical papyrus 1930) Clavicle fractures comprise 2% of all fractures and 35–45% of all shoulder girdle injuries in adults (Nordqvist and Petersson 1994, Postacchini et al. 2002) [1,2]. The incidence in western countries is

around 50–64 per 100 (Nordqvist and Petersson 1994, Nowak et al. 2000). They are more common in men (68%) (Postacchini et al. 2002)[2]. Clavicle fractures are classified according to the anatomical site and degree of displacement (Neer 1960[14], Allman 1967, Robinson 1998)[7]. Most clavicle fractures are situated in the middle part (81%), whereas lateral (17%) and medial fractures (2%) are much less common (Postacchini et al. 2002)[2]. Clavicle fractures are one of the most common adult injuries, accounting for 5% to 12% of all fractures and representing up to 44% of injuries to the shoulder girdle.[3- 5] About 80% to 85% of these fractures occur in the midshaft of the bone due to its narrow cross section and high compressive force resulting in bone failure.[6-9] While midshaft clavicle fractures have traditionally been treated with conservative measures, recent operative treatment of displaced, comminuted(Z- fragment) midshaft clavicle fractures has become more common.[10-11]

However, a recent review on midshaft clavicle fracture treatment methods shows that the consensus on optimal treatment is inconclusive, due to lack of evidence. Due to anatomical position, deformed shape, fracture more common in middle third part and limited access to clavicle the incidence of nonunion and symptomatic malunion are very high in conservative group as reported by Canadian orthopedic and trauma society. Here we have compared the conventionally managed conservative method versus surgical method for the management of clavicle fracture at KIMS General Hospital, Amalapuram, Andhra Pradesh India. It is a tertiary health care center.

## MATERIALS AND METHODS

This was cross-sectional study carried out at KIMS, Medical College and Research Foundation and KIMS General Hospital, Amalapuram Andhra Pradesh, India. Patients with clavicle fracture during the one-year period i.e February 2022 to January 2023. So during the one-year period there were 52 patients with clavicle fracture were enrolled to study out of the 52 with the written and explained consent 26 patients were managed conservatively and 26 managed surgically by Compression Plate (LCP) Patient were selected randomly for conservative and surgical way

of management. Inclusion criteria for study was significantly displaced fracture, comminuted closed fractures, no neurovascular involvement, no ipsilateral humerus or chest injuries for both the groups. Similarly, exclusion criteria were undisplaced fracture, open fractures, pediatric and very old age patients, surgically unfit patients, patient with multiple rib fractures and ipsilateral humerus fractures and patient with frozen shoulder. The details of the patients like age, sex, site of injury, mode of injury, alcohol influence at the time of injury, fracture pattern transverse, short oblique, long oblique, comminution & Z- fragment. The fracture anatomy and fracture union status evaluated by doing radiological evaluation by taking x ray - clavicle with shoulder joint AP x ray. Conservative treatment consists of 6 weeks of immobilization with figure of 8 bandage and the cuff and collar sling and shoulder mobilization thereafter as per patient comfort. The surgical management consist of LCP osteosynthesis and early shoulder mobilization as per patient comfort from day 2 post op. The average duration of the wound healing, fracture healing period, functional outcome (pain, ability to do daily activity, range of movement and muscle strength), and various complications were noted. All the patients were given proper physiotherapy sessions (1:1) and pain relief management efficiently on opd basis and follow up was done meticulously at 2,6,12,24 weeks. Functional result of shoulder in both the groups measured at the end of 24 weeks by Constant and Murley score evaluating shoulder in view of pain 15 points, and activities of daily living 20 points, range of movement 40 points and strength 25 points. Maximum points being 100. The result classified into excellent (90-100 points), Good (80-90 points), satisfactory (70-80) and poor (below 70 points). The statistical analysis was done by chi-square test and unpaired t-test and analyzed by SPSS 19 version software.

## RESULTS AND OBSERVATIONS

52 patients with clavicle fracture were enrolled to study out of the 52 with the written and explained consent 26 patients were managed conservatively and 26 managed surgically by Compression Plate (LCP). Table 1,2.

**Table 1: Demographic distribution**

	Group C(n=26)	Group S(n=26)	P value
Age	42.12 ±3.23	41.19±4.19	p>0.05,t=0.72,df=49
Sex			
Male	16	18	p>0.05
Female	10	8	X <sup>2</sup> =0.347,df=1

The average age was comparable in both the groups i.e., 42.12 ±3.23 and 41.19±4.19 (p>0.05, t=0.72, df=49) and the male to female ratio was also comparable in both the groups i.e., 1.5: 1 and 2.1: 1 (X<sup>2</sup>=0.347, df=1).

**Table 2: Distribution of the patients as per the healing time (months) on x-ray.**

	Group C(n=26)	Group S(n=26)	P value
Healing of fracture(Months)	5 ± 3.45	2.98± 2.87	P<0.05, t=4.46,df=49

The average healing period was significantly more in conservative management group i.e.,  $5 \pm 3.45$  months versus  $2.98 \pm 2.87$  ( $p < 0.05$ ,  $t = 4.76$ ,  $df = 49$ ).

**Table 3: Distribution of the patients as per the various complications.**

Complications	Group C(n=26)	Group S(n=26)
No any complications	18	23
Symptomatic Mal union	3	0
Union with symptoms	2	1
Delayed union	2	1
infection	0	1
Non union	1	0

( $X^2 = 6.119$ ,  $df = 5$ ,  $p > 0.05$ ).

The complications were symptomatic Mal-union, Union with symptoms, Delayed union, Infection etc. The complications were comparable in both the groups ( $X^2 = 6.119$ ,  $df = 5$ ,  $p > 0.05$ ). Table. The difference of constant and Murley scoring of the two groups regarding functional outcome was not significant at the end of 6month.

**RADIOLOGY EVALUATION-Clavicle AP X ray**



**Z fragment comminution**



**Midshaft fracture Clavicle**

### TREATMENT BY CONSERVATIVE MANAGEMENT



Fracture clavicle mid shaft



Figure of 8 bandage application in OPD



Figure of 8 bandage & sling front & back view

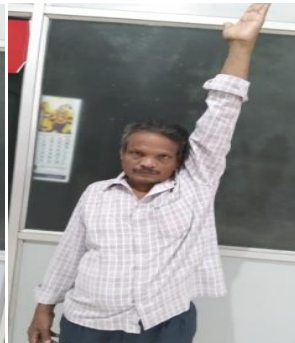
### RESULT OF REHABILITATION OF CONSERVATIVE MANAGEMENT



Full abduction & external Rotation after 3-month



Full flexion after 3 month



Full abduction after 3 month



Full internal rotation after 3 month



CLAVICLE FRACTURE UNITED (20 weeks)

### OPERATIONS DETAIL



Plates



Reduction technique



LCP plate application



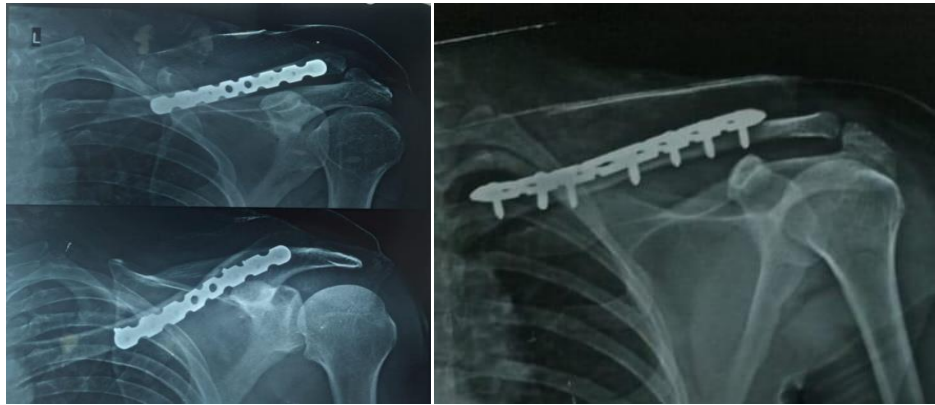


C arm image intra op

Wound closure

Healed surgical scar 2 weeks post op

**RESULT OF OPERATIVE CASES**



Anatomical fracture healing at the end of 3 months (12 weeks)

**RESULT OF POST OP REHABILITATION**



2 weeks post op full post op

Full Extension 6 weeks 6 weeks post op

Full abduction weeks post op

Full flexion 6 Abduction



Full internal rotation 6 weeks post op Touching T 7 spine



Push up on the wall in standing position 3-month post op

## DISCUSSION

The commonly compared studies are Bostman et al [12] study which treated 103 patients with middle third clavicle fractures, by early open reduction and internal fixation with plate and screws. Cesare Faldini et al [13] study was also used to compare the results, where 100 patients with a clavicle mid shaft fracture were treated by figure of eight clavicle brace. In a study conducted to analyze the results of conservative treatment by Hill et al [6,15] in 1997, Nordqvist et al in 1998 and Robinson et al [5] in 2004 found poor results following conservative treatment of displaced middle third clavicle fracture. Previously, mal-union of the clavicle (which is typical with displaced fractures) was thought to be of radiographic interest only and required no treatment. Acute clavicle fractures were traditionally treated nonoperatively. This treatment strategy reportedly achieved high union rate, good functional recovery, and high patient-related satisfaction; Neer [14] reported low nonunion rates after nonoperative treatment of mid-shaft clavicle fracture of 0.1%. Neer's study also included pediatric age group. So, it has high rate of union and good functional outcome when treated conservatively. Although nonoperative treatment was the major treatment strategy used for a long time, recent studies have identified higher rates of nonunion and symptomatic malunion. In addition, patients treated nonoperatively are at high risk of clinical symptoms such as pain, loss of strength, and rapid fatigability associated with nonunion and malunion of clavicle fractures due to displacement/shortening of clavicle (more than 2. cm is significant as mentioned in Rockwood and Green text book). [15] Thus, outcomes following nonoperative treatment are being increasingly doubted by researchers. [16] The available literature reports nonunion rates of up to 15% when nonoperative treatment was used for displaced mid-shaft clavicle fractures. [17] In our study we have seen that the average age was comparable in both the groups i.e.  $42.12 \pm 3.23$  and  $41.19 \pm 4.19$  ( $p > 0.05$ ,  $t = 0.72$ ,  $df = 49$ ) and the male to female ratio was also comparable in both the groups i.e. 1.5 : 1 and 2.1 : 1 ( $X^2 = 0.347$ ,  $df = 1$ ) In this study, the most common mode of injury was road traffic accident and in this study, most of the cases were found under influence of alcohol. This may be because our hospital situated in rural area. Most common fracture was short oblique fracture followed by transverse fracture and comminution and few of z type of fracture were also noted. This is comparable to the studies published earlier. In our study most of fractures treated by clavicle anatomical locking compressive plates fixed superiorly to clavicle and few cases locking recon plate was used and fixed anteriorly. In our study we noted symptomatic malunion, delayed and nonunion of fractures as complication in conservative group and one infection case noted in operative group and we have to remove the plate and later managed, it by conservatively and

united after 24 months. The average fracture healing duration was significantly more in conservative management group i.e.,  $5 \pm 3.45$  months versus  $2.98 \pm 2.87$  ( $p > 0.05$ ). Both therapeutic modalities demonstrated comparable efficacy. In our study we observe patient satisfaction was more in operative group in early course of treatment than the conservative group. (similar finding noted in Canadian orthopedic and trauma society study and Gyanendra Kumar Jha 2018 study) This is because of short duration of immobilization and early rehabilitation after plate fixation compare to one and half month immobilization in figure of 8 bandage and sling in conservative group. Functional recovery was found comparable at the end of 24 weeks in both the group but it was slight early duration in operative group. In strength wise and early fatigability comparison, operative group was little better than the conservative group. So, our study reports were comparable to the studies published earlier with similar findings. For active and younger patients, we would favor a surgical treatment due to the short time of rehabilitation, early return to work or sport activities and the high non-union and symptomatic malunion rate, after conservative treatment.

## CONCLUSION

Clavicle fractures, conventionally treated conservatively, may lead to suboptimal outcome specifically in comminuted, displaced, angulated midshaft and lateral third clavicle fracture. Mid third clavicle fractures treated by locking plate achieves reliable bony union and provides a more rigid stable fixation which does not require immobilization for longer periods. It can be concluded from our study that both the methods were comparable with respect to the complications but healing was significantly faster, and excellent functional outcome in early phase of treatment and good satisfaction of patient in early phase of treatment in the surgical method of management, hence surgical management should be preferred but the management should be tailored as per the patient condition. As this is a single centric trial with small number of cases, more multicentric trials with large number of cases and more study trials are needed for operative treatment with longer duration of follow up to rationalize the line of treatment for clavicle fracture.

## SOURCE OF FUNDING

None

## CONFLICT OF INTEREST

None

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