Library Progress International
Vol.44 No.3, Jul-Dec 2024: P. 22045-22048

Print version ISSN 0970 1052
Online version ISSN 2320 317X

Original Article

Available online at www.bpasjournals.com

Clinical Outcome of Conservatively Managed Midshaft Clavicle Fractures in Adults

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How to cite this article: Seeyan M Shah, Asif Nazir Baba,Azad Ahmad Shah, Iftikhar H Wani, Naseem-ul-Gani ,Asif Nazir Baba (2024) Clinical Outcome of Conservatively Managed Midshaft Clavicle Fractures in Adults. *Library Progress International*, 44(3), 22045-22048.

ABSTRAC

Clavicle fractures are among the most common skeletal injuries accounting for 2-5% of all adult fractures. Historically, nonoperative treatment of midshaft clavicular fractures was considered the gold standard of care. Furthermore, nonoperative treatment has been challenged by an increasing popularity and rate of surgical fixations in recent years despite a lack of clear evidence in the current literature.

The aim of our study was to analyze the short term functional outcome of non-operatively managed displaced mid-shaft clavicle fracture.

Method In this prospective observational study, 46 consecutive patient with displaced midshaft clavicle fractures treated non-operatively in the Orthopedics Department at the Hospital for Bone & Joint Surgery, the associated hospital of the Postgraduate Department of Orthopedics, Government Medical College, Srinagar, from May 2021 to May 2023 were followed up to three months. All the patient after the diagnosis of the injury, received clavicle brace and arm pouch sling as non-operative management. Functional outcome assessment was done using the Constant score.

Result The mean age of the patient in our study was 36.47 +/- 6.42 years. Clavicle fracture predominant involved male gender (84.7% male Vs 15.3% female), right side was involved more commonly than left (71.6% right Vs 28.4% Left) and the most common mode of injury was Road traffic accident (RTA 60.1%, Fall 30.9% and sports 9%). The mean clavicle shortening was 0.865+/- 0.48cm. The mean constant score at final assessment 86.75/100. We observed significant correlation between clavicle fracture shortening and constant score at 3 months ($p < 0.001$).

Conclusion Our study revealed that functional outcome of non-operative management of displaced mid shaft clavicle fracture have a significant correlation with the amount of shortening.

KEY WORDS Clavicle fracture, Constant score, Non-operative

INTRODUCTION

Clavicle fractures are among the most common skeletal injuries accounting for 2-5% of all adult fractures with an incidence of 29-64 cases per 100.000 [1,2]. These injuries often result from moderate to high-energy mechanisms such as sports injuries or road traffic accidents. These fractures most commonly occur in the middle third of the shaft (80-85%), followed by distal third (15% to 20%); while fracture in medial third is rarely reported (0% to 5%).[1] Earlier studies focusing on rate of union and malunion showed that nonunion rate was significantly lower and the malunion that was seen was only of radiographic significance.[2,3] But over time with refinement in the surgical techniques, better implant design and careful patient selection has lead to better outcomes with the operative treatment of misdshaft clavicle fracture [4] Even though operative intervention is being carried out more frequently than ever before, non operative management still holds especial place in these cases. Historically, nonoperative treatment of midshaft clavicular fractures was considered the gold standard of care. This recommendation is based on the analysis of 2000 patients with a very low non-union rate of 0.13%, reported by Neer in 1960 and Rowe's publication from 1968 with an observed nonunion rate of 0.8% in 566 midshaft clavicular fractures [4, 5] . This study futher analyses if the amount of shortening has any association with the functional outcome.

METHODS

The prospective study was conducted in the Hospital for Bone & Joint Surgery, the associated hospital of the Postgraduate Department of Orthopedics, Government Medical College, Srinagar, from May 2021 to May 2023. The hospital is the major trauma centre catering to the Kashmir valley and parts of Ladakh and Jammu region, covering a population of 8 million. The study was approved from institutional review committee. A convenience sampling method was used for subject enrollment. Total of 46 patients diagnosed with displaced clavicle fracture and those opting for non-operative management were followed up over a period of three months **Fig. (1A)**. The subjects included in the study were aged between 20 to 55 years. Fracture with absolute indication for surgery like skin tenting with impending skin puncture, compound fracture, floating shoulder and simultaneous neurovascular injury and fracture with associated injury were excluded. Detailed history regarding age, gender and side of involvement were noted. Physical examination was done to rule out skin tenting, open wound and distal neurovascular status. The amount of clavicle shortening was measured and recorded in centimeters at the time of enrollment. Cases were managed with clavicle brace and arm pouch. The follow up at was carried out at 3 weeks, at 6 weeks and at 3 months. At follow up, radiological and clinical evaluation was done to know fracture union. At the end of 6 weeks, clavicle brace and arm pouch was removed and at 3months follow up, functional outcome was measured by using constant score.[5] Data were entered and analysed with SPSS. Discrete data was presented as frequency and percetages, and continous data was presented as mean and standard deviation. ANOVA test was used to compare means between groups.

RESULTS

There were total 46 patients in this study. The mean age of study population was 36.47 +/- 6.42 years (range 20 - 55 years). Male prepondarance (84.7%) was seen. The most common mode of injury was road-traffic Accident (60.1%) followed by fall (30.9%) and sports (9%). Right mid-shaft of clavicle was involved in 71.6 % patients while left mid-shaft of clavicle injury was seen in 28.4%. The average clavicle shortening was 0.865+/- 0.48cm. Minimum clavicular shortening was 0.1cm and maximum clavicular shortening was 1.8 cm. Out of 46 present at 3 months follow up, 32 patients had excellent result, 9 patients had good and 5 had fair results, as per Constant score **Fig. (1B)**. The mean of constant score at 3 months was 86.75/100. 16 patients had clavicle shortening of 0.1-0.5 cm, 18 patients had clavicle shortening of 0.51-1cm, 2 patient had clavicle shortening of 1.1-1.5cm and 10 patients had clavicle shortening of 1.51-2.0cm.**Table 1**The overall outcome was directly related to amount of clavicular shortening with lesser amount of faring well.

Fig. (1A). The antero-posterior radiograph shows an acute multifragmentary midshaft fracture of the clavicle with slightdisplacement and preserved contact of the bone fragments.

Table 1. Relationship of clavicular shortening with functional outcome

"Constant score" at 3 months	X ray (shortening of clavicle)		P value
	Mean (cm)	SD (cm)	< 0.001
Excellent	0.52	0.28	
Good	0.94	0.50	
Fair	1.82	0.21	

DISCUSSION

There is still controversy among many surgeons regarding treatment of middle third clavicle fracture whether to operate or to treat non-operatively in an adult patient.[6] As far as the literature is concerned, there are no quantitative data indicating that clavicle fractures should be treated surgically.[7] The result of our study, non-operative (conservative) management of minimally displaced mid shaft clavicle fracture had shown good functional outcome. The mean age of patients in the study was 36.47 years. The maximum number of the patients were in age group of 20–35 years. In study done by Nordqvist et al,Napora J K et al, De giorgi et al and Ban et al,mean age were 33 years, 37.7 years, 38.9 years and 30 years respectively.[8,9,10,11] Findings of age distribution of our study matches with many study showing that fracture is commonly occurring in younger active individuals.

Fig. (1B). The antero-posterior radiograph of the same fracture at follow-up 16 weeks after trauma demonstrates an only marginal increase of the initial displacement with progressive callus formation.

In our study, 84.7% were male and 15.3% were female. Predominantly right side was involved (71.6%). Epidemiological study done by Postacchini F et al12 had similar results with 68% male patients and 61% left side involvement. Akin to our study, Kihlström et al13 had 68 % male patient, Ilija Ban11 had 70 % male patient and Napora J K et al9 had 84% male patients. So the overall tendency of male involvement reflects their nature of work and their involvement in the adventure activities and contact sports. The most common mode of clavicle fracture in our study was road traffic accident (60.1%). Among the male, road traffic accident lead to clavicle fracture in 84.61% of patients but among female fall injury was the major cause (100%). In study done by Nowak[14] in 2000 in Uppsala, Sweden also concluded that bicycle accident were the most common cause of injury. The constant score of our study varied from 64 – 100 with mean 86.75 at 3 months. The result of our study is similar to study done by Lazarides S et al15 with mean Constant score of 84 (range 62–100) and Pal CP et al[16] with mean constant score of 85.5. However, in the study by Bajuri et al7 , Constant shoulder score varied from 39 to 94, with a mean of 77.19 at 6 months. and Silvana De Giorgi et al10 mean Constant Shoulder Score was 77.9, which is less than our score. The result of our study mean was high as compared to other study with non-operative management but the value is less as compared to mean constant score of operatively managed clavicle fracture. Most authors showed that mean constant score in operative group was >90.16 High mean constant score in our study may be because most of our cases had less than 1.5 cm of clavicle shortening. Increase amount of clavicle shortening leads to a clear difference in scapula resting position with decreased tilt, an increased lateral rotation and increased protraction leading to a significant change in scapulothoracic and glenoid orientation. There is a progressive effect of shortening on the malposition of the scapula. The shortening also leads to a significant change in scapula position and orientation, which is maintained during the full abduction and forward flexion motion. Thus, amount of shortening and shoulder functional outcome have inverse relation.[17] This is also evident in our study as those patient with clavicle shortening >1.5 cm had reduced shoulder function at 3 months. The result of our study is similar to study done by Bajuri et al7 who also showed that shortening (in the AP view) of 15 mm or more had an effect on reducing the Constant score at 6 months. De giorgi et al[10] also showed that mean clavicle shortening of 15.2 mm increases patients dissatisfaction. However, Waldmann et al[18] showed that solid evidence in favour of nonoperative treatment for fractures with a displacement of less than 2cm and remaining contact of the bone fragments. Hoogervorst et al[19] also showed that a shortening of > 2 cm or > 10% is presumed to be an indicator for poorer outcomes. Goss et al.[20] also reported that shortening of more than 15 mm was associated with shoulder discomfort and dysfunction. Lazarides S et al[15] had reported that shortening of more than 14 mm was associated with unsatisfactory results. In our study,two cases of clavicle fracture had delay in union and reduced

shoulder function as compared with those clavicle fractures which were united. The result is similar to study done by Bajuri et al[7] showing significant correlation between the fracture union and the constant score at 6 months.

CONCLUSION

The results of our study revealed that conservative (non-operative) management of minimally displaced mid shaft fractures of the clavicle had a good functional outcome. The amount of clavicle shortening had direct bearing upon the functional outcomeof the patient. Our study was limited ny number of patients as it was done only at one centre and we recommnd a multi-centric trial to verify our findings.

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