

Functional Outcome of Non-Operatively Treated Displaced Mid-shaft Clavicle Fractures in Adult

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ABSTRACT

Background

Clavicle fractures are common injuries in young, active individuals, especially those who participate in sports where high-speed falls or violent collisions are frequent. There is increasing trend towards operative treatment closed midshaft clavicle fracture but it needs a cautious case selection. Study aim was to analyze the short term functional outcome of non-operatively managed displaced mid-shaft clavicle fracture.

Method

In this prospective observational study, 33 consecutive patient with displaced mid-shaft clavicle fractures treated non-operatively in the Orthopedics Department at the Tribhuvan University teaching hospital 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 32.42 +/- 7.83 years. Clavicle fracture predominant involved male gender (78.8% male Vs 21.2% female), left side was involved more commonly than right (63.6% Left Vs 36.4% Right) and the most common mode of injury was Road traffic accident (RTA 66.7%, Fall 27.3% and sports 6%). The mean clavicle shortening was 0.723 +/- 0.52 cm. The mean constant score at final assessment 89.67/100. 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 fracture accounts approximately 2.6% of all fracture. 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 midshaft 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. Non-operative management of clavicle fractures might be the most viable option for patients in resource limited setting like ours Our study was carried out to find out the functional outcome of nonoperative management of clavicular fracture in patient who opted for nonoperative treatment. This study further analyses if the amount of shortening has any association with the functional outcome.

METHODS

The study was a hospital-based prospective observational study done at a University Teaching Hospital from January 2018 to June 2019. The study was approved from institutional review committee. A convenience sampling method was used for subject enrollment. Total of 33 patients diagnosed with displaced clavicle fracture and those opting for non-operative management were followed up over a period of three months.

The subjects included in the study were aged between 20 to 50 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 are presented as frequency and percentages, and continuous

data are presented as mean and standard deviation. ANOVA test was used to compare means between groups.

RESULTS

There were total 33 patients in this study. The mean age of study population was 32.42±7.83 years (range 20 - 50 years). Male preponderance (78.8%) was seen with M:F ratio of 26:7. The most common mode of injury was road-traffic Accident (66.7%) followed by fall (27.3%) and sports (6%). Left mid-shaft of clavicle was involved in 63.6% patients while right mid-shaft of clavicle injury was seen in 36.4%.

The average clavicle shortening was 0.72 ± 0.52 cm. Minimum clavicular shortening was 0.1cm and maximum clavicular shortening was 1.9 cm.

Out of 31 present at 3 months follow up, 20 patients had excellent result, 9 patients had good and 2 had fair results, as per Constant score. The mean of constant score at 3 months was 89.67.

12 patients had clavicle shortening of 0.1-0.5 cm, 15 patients had clavicle shortening of 0.51-1cm, 1 patient had clavicle shortening of 1.1-1.5cm and 5 patients had clavicle shortening of 1.51-2.0cm. The overall outcome was directly related to amount of clavicular shortening with lesser amount of faring well.

Table 1. Relationship of clavicular shortening with functional outcome

| Constant score at 3 months | X ray (clavicle shortening) | | F | p value |
|----------------------------|-----------------------------|---------|--------|---------|
| | Mean (cm) | SD (cm) | | |
| excellent | 0.54 | 0.28 | 12.714 | < 0.001 |
| good | 0.92 | 0.50 | | |
| fair | 1.75 | 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 management of minimally displaced mid shaft clavicle fracture had shown good functional outcome.

The mean age of patients in the study was 32.42 years. The maximum number of the patients were in age group of 20 – 30 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.

In our study, 78.8% were male and 21.2% were female. Predominantly left side was involved (63.6%). 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 (66.7%). 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 Nowak¹⁴ 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 89.67 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 al¹⁶ 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 al¹⁰ also showed that mean clavicle shortening of 15.2 mm increases patients dissatisfaction. However, Waldmann et al¹⁸ 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 al¹⁹ 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 al¹⁵ had reported that shortening of more than 14 mm was associated with unsatisfactory results.

In our study, only one case 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 al⁷ showing significant correlation between the fracture union and the constant score at 6 months.

CONCLUSION

The result of our study revealed that non-operative management of minimally displaced mid shaft clavicle fracture had a good functional outcome. The amount of clavicle shortening had direct bearing upon the functional outcome.osteoarthritis. As the study has very few study population we recommend a multicenter study with a significantly large study population to verify the findings of our study.

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