



International Journal of Orthopaedics Sciences

ISSN: 2395-1958

IJOS 2019; 5(3): 575-578

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www.orthopaper.com

Received: 25-05-2019

Accepted: 27-06-2019

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Clinical profile of patients with clavicle fracture

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DOI: <https://doi.org/10.22271/ortho.2019.v5.i3j.1594>

Abstract

Fracture clavicles are known since ancient time, earliest description of fracture clavicle is found in Egyptian literature in 3550 BC. The clavicle is the only long bone in the body that lies horizontally. Medially, it articulates with the sternum at the sterno-clavicular joint. At its lateral end it articulates with the acromion, at the acromioclavicular joint. The study was conducted on 62 patients with fracture of clavicle, attending Emergency and Outpatient Department of Orthopedics, Medical College and Hospital. Patients were clinically examined; first aid was given in the form of, cuff and color sling, analgesics, antacids and was subjected to A-P view, Lardot view radiograph of full length clavicle to decide the plan of definitive management. If needed CT scan and MRI were also taken. In our study out of 62 patients 42 (67.74%) patients sustained trauma due to road traffic accident, 15 (24.19%) patients fall from height and 5 (8.06%) patients from assault. Thus commonest (67.74%) mode of trauma was road traffic accident. Fractures of middle third of clavicle only were included in the study and medial end and lateral end were excluded as per our criteria. None of the patient had bilateral involvement.

Keywords: Clavicle, fracture, RTA

Introduction

The clavicle is the only long bone in the body that lies horizontally. Medially, it articulates with the sternum at the sterno-clavicular joint. At its lateral end it articulates with the acromion, at the acromioclavicular joint.

The anterior surface is convex forward and gives origin to the pectoralis major. The posterior surface is concave, smooth and gives origin to the sternohyoid muscle at its medial end. The superior surface is rough at its medial part and gives origin to the sternocleidomastoid muscle. The inferior surface has an oval impression at its medial end for the costoclavicular ligament. At the lateral side of inferior surface, there is a subclavian groove for insertion of the subclavius muscle.

Fracture clavicles are known since ancient time, earliest description of fracture clavicle is found in Egyptian literature in 3550 BC.

As early as 400 BC, Hippocrates observed fracture of clavicle unite rapidly with prominent callus and deformity but healing proceeds uneventfully ^[1].

O'Neill *et al.* (2011) reported that clavicular fractures are common, comprising 2.6–10% of all fractures, and approximately 80% of clavicle fractures involve the middle shaft. Kim & McKee, (2008) reported that the majority of these clavicle fractures occur in patients who are younger than 40 or older than 70 years.

Postacchini *et al.* (2002) reported that more than 50% of clavicle fractures are displaced.

The treatment of these fractures has been usually conservative up to 20th century.

Neer *et al* (1963, 1984) found a non-union rate of 33.3%, very high risk of delayed union and malunion 25% using conservative methods which results in shortening, disfigurement ^[2].

Edwards *et al.* (1992), in a series of 43 patients with type 2 fractures, found a much higher incidence of local complications, residual shoulder dysfunction and non-union using conservative methods and recommended open reduction and internal fixation as the treatment of choice.

Hill JM *et al.* (1997) evaluated 242 consecutive fractures of the clavicle in adults which had been treated conservatively. Of these, 66 (27%) were originally in the middle third of the clavicle and had been completely displaced. They reviewed 52 of these patients at a mean of 38 months after injury. Eight of the 52 fractures (15%) had developed nonunion, and 16

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patients (31%) reported unsatisfactory results. Thirteen patients had mild to moderate residual pain and 15 had some evidence of brachial plexus irritation [3].

Of the 28 who had cosmetic complaints, only 11 considered accepting corrective surgery.

Nordqvist, Petersson *et al.* (1998) a retrospective study of 225 pt. mid-clavicular fractures that had been treated nonsurgically. Evaluations was done both clinically and radiographically, an average of seventeen years after injury. Conclusion of this study is few patients with fractures of the mid-part of the clavicle require operative treatment due to non-union and malunion.

Nowak *et al.* (2004) long-term, prospective study was done to identify risk factors associated with the outcome of clavicular fractures. 208 patients seen at the 9- to 10-year follow-up, 112 (54%) had recovered completely whereas 96 (46%) still had sequelae. He also notice that nonunion occurred in 15 patients (7%). No bony contact was the strongest radiographic predictor for sequelae [4].

Comminuted fractures with transverse fragments had a significantly increased risk for remaining symptoms, as did older patients, whereas there was no significant difference between sexes.

He also found that fracture location and shortening did not predict outcome except for cosmetic defects and angulation of the fracture had no effect on cosmetic defects. He also found that patients with predictive risk factors, such as fractures with no bony contact or displacement, especially if comminuted, and also elderly patients with fractures should be considered for more active treatment options [5].

S. Lazarides *et al.* (2005) found that Clavicular shortening following fracture union was 11.4 mm on average (range 3–25 mm), and was encountered in 120 patients. Intra- and inter-observer variability of measurements was not significant. Fracture healing time averaged 10 weeks (range 6–20 weeks) and 5.3% of patients presented delayed union. Thirty-four patients (25.8%) were unsatisfied with the result. The mean Constant score was 84 (range 62–100). Forty patients were having pain, and 21 had shoulder function impairment. Shortening >14mm was statistically associated with unsatisfactory results [6].

Methodology

The study was conducted on 62 patients with fracture of clavicle, attending Emergency and Outpatient Department of Orthopedics, Medical College and Hospital.

Inclusion Criteria

- Age between 16 years to 60 years.
- Within 2 weeks of fracture clavicle.
- Displaced fracture of Mid shaft clavicle
- Shortening > 2 cm
- Segmental fractures
- Bilateral clavicle fracture
- Clavicular fracture associated with other injuries.
- Grade I and II compound fractures.

Exclusion Criteria

- Age below 16 years and above 60 Years.
- Preexisting pathology in shoulder or elbow or both.
- Fracture more than 2 weeks.
- Fracture of lateral end clavicle and medial end.
- Scapular malposition and winging on initial examination.
- Floating shoulder.

- Patient who do not give consent.
- Grade III compound fractures.

Patients were clinically examined; first aid was given in the form of, cuff and color sling, analgesics, antacids and was subjected to A-P view, Lardotic view radiograph of full length clavicle to decide the plan of definitive management. If needed CT scan and MRI were also taken.

Those requiring surgery were classified as per Allman classification and investigated for fitness for anesthesia and surgery.

The relevant data were recorded in the working Proforma.

Selected patients were randomly divided in Group I and Group II. Patients of group I were treated by, closed/open reduction & internal fixation by TENS and Group II by open reduction & internal fixation by plate & screws. Patients were followed periodically at 2 weeks, 6 weeks, 3, 6, 12 months, 18 months and 24 months.

Results

Table 1: Shows Age Distributions In Patients Of Fracture Clavicle

Age distribution (in years)	Numbers	Percentage
16-20	4	6.25%
21-30	30	48.39%
31-40	20	32.26%
41-50	5	8.06%
51-60	3	4.84%
Total	62	100%

In our study the youngest of the patients was a 17 years old male and the oldest was 60 years old elderly female, but most (48.39%) of the patients were in age group between 21 to 30 years. average age, overall, of 62 patients was 30.58 years, and that of group I was, 30.22 years and group II was, 30.34 years. Thus the average age was not significantly different in both groups of patients.

Table 2: Table Shows Sex Distributions In Patients Of Clavicle Fractures

Sex	Number	Percentage
Male	40	65%
Female	22	35%
Total	62	100%

In our study of 62 patient of fracture clavicle 40 (65%) patients were male and 22 (35%) patients were female. This observation clearly shows male preponderance (65%) in cases of fracture clavicle.

Table 3: Table Shows Mode of Injury In Patients Of Clavicle Fractures

Mode of injury	Numbers	Percentage
Road traffic accident	42	67.74%
Fall from height	15	24.19%
Assault	5	8.06%
Total	62	100%

In our study out of 62 patients 42 (67.74%) patients sustained trauma due to road traffic accident, 15 (24.19%) patients fall from height and 5 (8.06%) patients from assault. Thus commonest (67.74%) mode of trauma was road traffic accident.

Table 4: Shows Nature of Fracture

Nature of fracture	Number of cases	Percentage
Closed	57	91.94%
Open	5	8.06%
Total	62	100%

Table shows that fractures of clavicle are usually (91.94%) closed injuries and 5(8.06%) was open injuries. All the patients of open fracture clavicle were compound grade I and inside out injury due to piercing of skin by sharp bony end.

Table 5: Nature of Fracture

Nature of fracture	Group I	%	Group II	%
Closed	28	90.2	29	93.54
Open	3	9.67	2	6.45
Total	31	100	31	100

Three open fractures were managed by TENS and two open fractures were managed by plate.

Table 6: Shows Types of Fracture (Pattern of Fracture)

Types of fracture	Number of cases	Percentage
Transverse	41	66.13%
Oblique	10	16.13%
Spiral	2	3.23%
Comminuted	5	8.06%
Segmental	4	6.45%
Total	62	100%

Fractures of middle third of clavicle only were included in the study and medial end and lateral end were excluded as per our criteria. None of the patient had bilateral involvement.

Transverse type of fracture was commonest type i.e. 66.13%.

Discussion

Males outnumbered females in ratio of 40:22. Male preponderance (65%) in cases of fracture clavicle was universal observation, and was also observed by Postacchini *et al.* (2002), Paladini *et al.* (2012), Mishra *et al.* (2014), Madhukar *et al.* (2015), Masatwar *et al.* (2016).

Postacchini *et al.* (2002) reported Male: Female ratio=68:32 Fracture of clavicle is more common in younger patients, many workers, Kim & McKee *et al.* (2008), Paladini *et al.* (2012), Mishra *et al.* (2014), Madhukar *et al.* (2015), Masatwar *et al.* (2016) have reported that fracture clavicle occurs more commonly in younger patients below the age of 40 years [7].

Kim & McKee, (2008) reported that the majority of these clavicular fractures occur in patients who are younger than 40 or older than 70 years. 50 out of 62(80.65%) patients, of our cases were in the age group of 21-40 years which is in accordance of observations reported by other workers [8].

Preponderance of fracture middle 1/3rd clavicle in young males is due to their involvement in heavy work and outdoor activities making them more prone to these injuries.

Road traffic accident is the commonest mode of injury in our study other causes were fall from height or assault. Males are more exposed to all these mode of injuries as compared to females. It further explains male preponderance of these fractures.

57 of 62 patients were closed injuries and 82.26% Of them were transvers/ short oblique fractures. Similar observations were reported by, Oliver *et al.* (2012), Masatwar *et al.* (2016) that fracture of middle 1/3rd of clavicle. These fractures are usually the result of indirect injury i.e. muscular forces as compare to direct assault.

Up to 20th century the treatment of these fractures was usually conservative which did not involves the reduction of fracture and is unable to hold the fracture reduced hence the end results was malunion /nonunion/shortening &deformation, which decreases the functional capability of affected upper limb, disfigurement and poor cosmeses [9].

Fractures of clavicle are known since ancient time, earliest description of fracture clavicle is found in Egyptian literature in 3550 BC.

Up to 20th century the aim of treatment was union of fracture in whatsoever position fracture unites. Many methods of conservative treatment namely triangular sling, cuff and collar sling, three sling method, figure of eight bandage, figure of eight POP shoulder Spica, clavicular brace, arm shoulder pouch and many others have been described from time to time.

All these methods did not involves the reduction of fracture or unable to hold the fracture reduced hence the end results was malunion (25%)/nonunion (33.3%) in various cases. Neer *et al.* (1963, 1984).

The malunion resulted in shortening, deformation, disfigurement and poor cosmeses shortening (reduced distance between sternoclavicular joint to the shoulder joint) resulted in biomechanical disadvantage, persistence of pain, limitations of functions and reduction of strength in upper limb in some of these cases [10].

With increasing awareness and demand of the patient and consumer protection court surgeons felt the need for operative intervention and perfect alignment of these fracture to achieve perfect alignment of fragments.

Better operative technique; improve metallurgy and availability of image intensifiers made the operative techniques as a method of first choice by more and more surgeons

Various surgical treatment described are

1. K wire fixation
2. Austin Moore pins
3. Knowles pins
4. Rockwood pin
5. Intramedullary screw fixation
6. Steinman pins
7. External fixator
8. TENS
9. Plate and screw

This study was conducted on 62 patients of fracture of middle 1/3rd of clavicle, which were randomly divided in two groups, Group I & Group II. Patients of group I were treated by Closed/Open reduction and internal fixation by TENS and patients of group II were, treated by Open reduction and internal fixation by plate and screws. Patients were followed periodically at 2weeks, 6 weeks, 3, 6, and 12 months.

Results were evaluated by Constant scoring system given by Murley (1987). Over all plate had more intra op and post op complications like more blood loss, more operative time, superficial infections, deep infections, implant protuberance, ugly scar, difficult implant removal than TENS fixation. In this study nonunion was equal in both TENS and plate fixation groups. The range of motion calculated according to constant scoring system of Murley achieved after fracture union. According to our study, at the end of this study no significant differences was found in functional outcome between TENS and plates fixation ($p>0.05$).

Finally in our study no significant difference was found in function and nonunion rate in both the groups but major

complications and union time are more in plate fixation group than TENS group so, TENS fixation is the preferred treatment of choice for fracture middle 1/3rd clavicle.

Conclusion

- Young (21-40years) active adults who more often get involved in outdoor activities, are more commonly (80.65%) affected by this fractures.
- Males (65%) were more affected than females.
- Road traffic accident (67.74%) was the most common cause of trauma resulting in the fracture of clavicle.
- Left side (67.74%) clavicle is more affected than right side (32.25%).
- Transverse fracture (transverse +short oblique) pattern was found to be the most common (82.26%) fracture patterns.
- Most of the cases (91.94%) had closed fracture, while (8.06%) were open fracture.

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