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To Study the Outcome of Displaced Fracture Clavicle Treated by Plate Osteosynthesis: A Study in Teaching Hospital in North East India

Dr Ajit Tudu[1], Dr Narenjit Das[2], Dr Bhupes Sil[3], Dr Biplab Acharyya[4]

[1, 2]Junior Resident (Academic), Department of Orthopaedics, Agartala Government Medical College and Govind Ballabh Pant Hospital, Agartala, Tripura

[3]Associate Professor, Department of Orthopaedics, Agartala Government Medical College and Govind Ballabh Pant Hospital, Agartala, Tripura

[4]Professor and Head of the Department of Orthopaedics, Department of Orthopaedics, Agartala Government Medical College and Govind Ballabh Pant Hospital, Agartala, Tripura

Abstract: ***Introduction: Fracture of the clavicle is common, especially in young adults with a prevalence rate of 3-5% with midshaft fracture accounting for 85% of all clavicle fractures. Displaced midshaft clavicle fracture are prone todelayed union, mal-union and non-union with decrease in normal activity and work. Open reduction and internal fixation with plating provides rigid fixation, low rates of non-union and malunion with early functional recovery. Material and Methods: It was a cross-sectional, Hospital based study conducted in the Orthopedics Department of AGMC&GB Pant hospital, Agartala from May 2017 to May 2019 in which functional outcome of 30 cases of displaced mid shaft clavicular fractures treated with open reduction and internal fixation with plate osteosynthesis was evaluated using Constant Murley score. Results: In our study majority (70%) of the patientswere male with dominant side involvement in 73% of cases. In 76 percent of the cases fracture united within 10 weeks with average union rate of 8.2 weeks. Among complications, 5 cases complained of hardware prominence, implant loosening with failure was seen in 1 caseand superficial infection in 2 cases. In our study 90% of the cases had excellent to good functional outcome while poor outcome was seen in only3% of cases. Conclusions: We conclude that open reduction and internal fixation of displaced mid shaft fracture clavicle results in excellent functional outcome with an early return to normal activities and is associated with minimal complication rate.***

Keywords: Displaced midshaft clavicle fracture, open reduction and internal fixation with plate osteosynthesis, mal-union, delayed union, non-union, Constant Murley score.

1. Introduction

Midclavicular fracture is one of the most common injuries of the skeleton, representing 2.6 to 4% of all fractures and 45% of shoulder injuries. The annual incidence of midclavicular fracture is 64 per 100 000 population. Fracture of the shaft form 70% to 80% of all clavicular fractures, lateral fractures contribute 15% to 30%, and medial fracture 3% are relatively rare. Open clavicular fracture is an absolute rarity, found in only 0.1% to 1% of cases. The rate of midclavicular fractures is more than twice as high in men as in women. The peak incidence occurs in the third decade of life1.

The incidence of nonunion of midclavicular fractures is usually quoted as being from 0.1 to 0.8% and the mainstay of treatment has long been nonoperative. These data, however, are based on studies in which clavicle fractures were not adequately classified regarding patient age and fracture displacement. More recent data, based on detailed classification of fractures, suggest that the incidence of nonunion in displaced comminuted mid shaft clavicular fractures in adults is between 10 and 15%2. Midshaft fractures have traditionally been treated non-operatively. Surgical treatment of acute midshaft fractures was not favoured due to relatively frequent and serious complications. However the prevalence of non-union or mal-union in dislocated mid shaft clavicular fractures after conservative treatment is higher than previously presumed and fixation methods have evolved. Surgery is accepted more and more as primary treatment for dislocated mid shaf clavicular fractures, mainly because the results of non-operative treatment are interpreted as inferior to operative treatment both clinically and functionally.

Several studies have examined the safety and efficacy of primary open reduction and internal fixation for completely displaced mid shaft clavicular fractures and have noted high union rate with a low complication rate3. In a large number of complex clavicle fractures a satisfactory outcome is possible with a low complication rate using a locked compression plate 4. Primary internal fixation of displaced comminuted mid-shaft clavicular fractures leads to predictable and early return to function 5.

We have taken up this study to gain a deeper understanding of results and problems associated with this procedure, to evaluate the functional outcome after fixation of displaced clavicular fractures with locking compression plate

2. Methodology

The study was conducted in the department of orthopedics, Agartala government medical college & G.B Pant hospital. After taking ethical permission from institutional ethics committee, present observational study was conducted during the period from November 2017 to November 2020 including all patient with displaced middle clavicle fracture having >18 years of age with closed fracture in both sex

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excluding patients who were unfit for surgery, open fracture, undisplaced fracture, fracture in proximal or distal third of clavicle, pathological fracture, associated with head injury, associated with neurovascular injury, established non union from previous fracture. Data of all the patients were collected from a specially designed performa pertaining to patients particulars, clinical examinations, investigations, diagnosis and surgical procedures. It is then subjected to statistical analysis.

3. Results

The observation in our study were as follows:

Table 1: Distribution of patients according to mode of injury

Mode of injury	Frequency	Percent
Fall on Shoulder	21	70.0
Fall on Out stretched Hand	4	13.3
Direct Trauma Over Clavicle	5	16.7
Total	30	100.0

Table 2: Age Distribution of patients

Age	Frequency	Percent
19-29	23	76.7
30-39	7	23.3
Total	30	100.0

Table 3: Sex Distribution of patients

Sex	Frequency	Percent
MALE	27	90.0
FEMALE	3	10.0
Total	30	100.0

Table 4: Distribution of patient according to side of fracture

Side	Frequency	Percent
RIGHT	24	80.0
LEFT	6	20.0
Total	30	100.0

Table 5: Duration between injury and surgery (days)

Days	Frequency	Percent
< 7 DAYS	22	73.3
> 7 DAYS	8	26.7
Total	30	100.0

Table 6: Time taken for fracture union (weeks)

Time in weeks	Frequency	Percent
8-10 WK	10	33.3
10-12 WK	17	56.7
> 12 WK	3	10.0
Total	30	100.0

Table 7: Distribution of patient according to Complication

Complication	*Frequency*	*Percent*
Hypertrophic Skin Scar	6	20.0
Plate Prominence	6	20.0
Delayed Union	3	10.0
Infection	1	3.3
Plate Loosening	1	3.3
Total	17	56.7

Table 8: Showing outcome based on constant murley score

Outcome	Frequency	Percent
Excellent	19	63.3
Good	8	26.7
Fair	2	6.7
Poor	1	3.3
Total	30	100.0

4. Discussion

Although clavicle fracture is usually treated conservatively for middle third, similar treatment for grossly displaced and communited fracture is prone for poor outcome. The best method for obtaining and maintaining an accurate anatomy remains a topic of considerable controversy. However recent evaluation of fracture pattern and result of treatment have demonstrated the need of surgical intervention. In our study thirty patients were treated with anatomical plate and reconstruction plate with screw for displaced middle third clavicle fracture and they were analysed for radiological, clinical and functional outcome.

Mode of injury

Bostman et al[8] studied mode of injury due to fall from two wheeler in 38 patient (36.8%), slipping and fall in 24 patient (23.30%), motor vehicle accident in 19 patient(18.45%), and sports injury in 22patient (21.36%). In our study 30 patients, with fall on shoulder in 21 patients, fall on outstretched hand in 4 patient and direct trauma in 5 patient. So our study shows indirect trauma (fall on shoulder) is the most common mode of injury.

Age Incidence: Bostman et al[8], 2001 study in patient with average age was 33.4years and youngest patient age was 19 years and oldest patient age was 62 years. Incho et al study in reconstruction plate group the mean age was 45 and that of locking compression plate was 46.In our study of middle third clavicle fracture there are 21 patient with age group 19-29 years, and 7 patient with age group 30- 39 years. Our study shows younger patient more prone for middle third clavicle fracture.

Sex incidence

Bostman et al[8] study the middle third clavicle fracture in 76 (73.79%) male patient and 27 (6.21%) female patient. In our study, out of 30 patient 27 patient are male and 3 patients are female. This shows incidence of clavicle fracture is more in male.

Time interval between injury and surgery

In Bostman et al[8]study all patient were operated within 3 days of injury. Incho et al[6]study the patient group with reconstruction plate were operated by 4 days of inury and the group with locking compression plate were operated by 9 days. In our study most patient were operated in first week of injury and rest are operated within 2-3 weeks.

Duration of fracture union

Lazarus MD[7] stated that radiological union occurs approximately between 6-12 weeks. Incho et al[6] study bony union for recurrent was 14.6 weeks and for locking compression plate was 3.2 weeks. In our study radiological union takes place in 10 -12 weeks in 17 patients, 8 -10

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weeks in 10 patients and more than 12 weeks in 3 patients. This infers that radiological union takes 10 -12 weeks in most patient.

Complication

Both Bostman et al[8] and Cho et[6] al did not found any major complication. Bostman et al[8] study 7 patient (6.8%) had implant loosening In Cho et al[6] study only 3 patients with reconstruction plate had implant loosening. In Bostman et al[8] study delayed union occurred in 3 patients (2.91%). Our study shows hypertrophic skin scar in 6 patients, plate prominence in 6 patients, delayed union in 3 patients, infection in 1 patient and plate loosening in 1 patient.

Functional Outcome

In this study of total 30 patients of middle third clavicle fracture ,functional outcome according to constant and murley 27 showed excellent results in 19 patients, good results in 8 patients, fair results in 2 patients and poor results in 1 patient.

5. Conclusion

Primary goal in treatment of this injury is to provide good reduction and immediate stability to achieve anatomical fracture union, allow the quick return of shoulder movement and avoid complication.Fracture mostly occur in youngs and with preponderance in males.Road traffic accidents and fall on shoulder (indirect injury) are the two most common modes of injury.

Subcutaneous anterior approach for middle third clavicle fracture provides good visualization of fracture site for internal fixation and care should be taken to avoid iatrogenic injury to vitals structure lying close proximity to clavicle.Intra -operative protector should be placed postero-inferiorly to avoid injury to neuro-vascular structure during drilling. To avoid stiffness of shoulder ,return to normal activities and work, exercises should be implemented as early as possible. Postoperatively, we found there is no neuro-vascular injury in our cases, only minor complication like hypertrophic skin scar, plate prominence in few cases and delayed union, plate loosening and infection rarely.

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