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Open Reduction & Internal Fixation in Case of Clavicle Fracture & Their Outcomes

Dr. Anjan Lal Ghosh[1*], Dr. Debdulal Debnath[2], Dr. SK. Ashraf Ullah[3]

[1]Associate Professor, Department of Orthopaedic Surgery, Northern International Medical College and Hospital, Dhaka, Bangladesh
[2]Consultant, Department of Orthopaedic Surgery, Central Police Hospital, Dhaka, Bangladesh
[3]Associate Professor, Department of Orthopaedic Surgery, Northern International Medical College & Hospital, Dhaka, Bangladesh

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***Corresponding author:** Dr. Anjan Lal Ghosh
Associate Professor, Department of Orthopaedic Surgery, Northern International Medical College and Hospital, Dhaka, Bangladesh

Abstract **Original Research Article**

Introduction: Clavicle fractures are common, and account for about 2.6 % of all fractures and nearly 44 % of those in the shoulder girdle. Fractures of the middle third of the clavicle are most common (81%). Surgical operation for displaced clavicle fractures is controversial. Traditionally, these fractures have been treated in non-operative ways. This traditional treatment is not without complications, such as shortening, nonunion, deformity and unsatisfactory patient outcomes. In recent days, operative treatment has proven superior results. ***Aim of the study:*** Early union & reliable treatment with predictable outcomes. ***Methods:*** This is a prospective study, a total of 15 patients were included and analyzed in this study. This study was carried out from January 2016 to June 2020 at Z. H. Sikder Women's Medical College Hospital & Northern International Medical College and Hospital. The method of fixation of the clavicular fracture was open reduction and internal fixation with a reconstruction plate in twenty patients, a hook plate and T-plate for distal clavicle fracture. ***Result:*** In this study, a total of 15 patients were included and analyzed. Table-1 shows the clinical characteristics of the study patients, 8(53.33%) patients were from the age range 31-45, 4(26.67%) patients were from the age range 15-39 and 3(20.00%) patients were from the age range 45-60. The male patients were 12(80%) and the female patients were 3(20%). Figure-1 shows the mean constant shoulder scores of patients. The complication of studying patients was shown in Table-4, 8(53.33%) patients were from unsatisfactory appearance, 4(26.67%) patients were from adhesive capsulitis, 3(30.00%) patients were from both superficial infection and paresthesia over the surgical site and 2(13.33%) patients were from non-union. ***Conclusion:*** In conclusion, the conservative treatment remains the treatment of choice for simple clavicle fractures, but for displaced and comminuted fractures surgical intervention is appropriate, especially when considering the overall outcome results.

Keywords: Reduction fixation & Clavicle Fracture.

INTRODUCTION

Clavicle fractures are relatively common accounting for 2.6-4.6% of all adult fractures [1]. Clavicular fractures have been traditionally treated with conservative management regardless of the degree of displacement because most of the early reports showed that nonunion in this type of fracture was quite rare [2]. However, this management concept had evolved from conservative to operative in the last decade. A multicenter randomized controlled trial showed that displaced clavicular fractures treated operatively with plate fixation were superior in terms of fracture union and functional outcomes compared with conservative management [3]. Moreover, operative management of clavicular fracture had resulted in an earlier return to work and a better functional outcome [4, 5]. The methods of operative fixation for clavicle fracture are mainly open reduction and internal fixation with wires, pins, or plates with screws [6-8]. The unique anatomical shape of the clavicle poses a challenge for the surgeon during reduction and implant placement. Hence, the pre-contoured locked plate is now the preferred choice of implant for this type of clavicle fracture because it provides greater stability and ease for plate placement [9]. However, being a non–weight-bearing bone, the question of fixation with a mechanical superior 3.5-mm locked compression plate (LCP) was raised.

METHODOLOGY & MATERIALS

This is a prospective study, a total of 15 patients were included and analyzed in this study. This study was carried out from January 2016 to June 2020 at Z. H. Sikder Women's Medical College Hospital &

Northern International Medical College and Hospital. The method of fixation of the clavicular fracture was open reduction and internal fixation with a reconstruction plate in twenty patients, a hook plate and T-plate for distal clavicle fracture. Intraoperative radiology and stress tests were done in all patients to ensure the stability of both fractures after fixation of the clavicle. The shoulder was immobilized in an arm to chest bandage for 3 weeks; followed by pendulum exercises in a sling. Six weeks after surgery, the sling was removed and patients started range-of-motion (ROM) exercises. Clinically the patients were evaluated with a constant shoulder score. Statistical analysis was performed using the IBM Statistical Package for Social Sciences version 22.0 (IBM SPSS Corp.; Armonk, NY, USA). The data were analyzed with an independent t-test and a Chi-square test. A p-value of <0.05 was the measure of significant difference.

Inclusion criteria

- Associated neurovascular injury
- Shortening>20mm
- Significant comminution
- Age range 25-40 years

Exclusion criteria

- Non-displaced Group
- Elderly, low-demand, high surgical risk patient
- Pediatric distal clavicle fractures (skeletally immature).
- Infection over the site of fracture.

RESULT

In this study, a total of 15 patients were included and analyzed. Table-1 shows the clinical characteristics of the study patients, 8(53.33%) patients were from the age range 31-45, 4(26.67%) patients were from the age range 15-39 and 3(20.00%) patients were from the age range 45-60. The male patients were 12(80%) and the female patients were 3(20%). From the Table-2 it shows that 12(80%) patients fall from height, 2(13.33%) patients were from direct trauma and only 1(6.67%) patient was from RTA. Table-3 shows the clinical result of the study patients, 14(93.33%) patients had a union rate, 13(86.66%) patients were from mean shoulder score (point), 12(80%) patients were from a return to work in 3 months and only 1 patient was formed symptomatic hardware. Figure-1 shows the mean constant shoulder scores of patients. The complication of studying patients was shown in Table-4, 8(53.33%) patients were from unsatisfactory appearance, 4(26.67%) patients were from adhesive capsulitis, 3(30.00%) patients were from both superficial infection and paresthesia over the surgical site and 2(13.33%) patients were from non-union. The fixation of the clavicle only was 60% and the fixation of the clavicle and scapula was 40% (Figure-2).

Table-1: Clinical characteristics of study patients (N=15)

Characteristics	Frequency	Parentage
Age		
15-30	4	26.67
31-45	8	53.33
45-60	3	20.00
Sex		
Male	12	80
Female	3	20
BMI		
Underweight (16-18.5)	3	20.00
Normal (18.5-20)	8	53.33
Overweight (25-40)	4	26.67

Table-2: Cause of injury (N=15)

Cause	Frequency	Parentage
Fall from height	12	80.00
Direct Trauma	2	13.33
RTA	1	6.67

Table-3: Clinical result of study patients (N=15).

Variables	Frequency	Parentage
Union rate	14	93.33
Mean shoulder score (point)	13	86.66
Return to work in 3 months	12	80
Symptomatic hardware	1	6.66

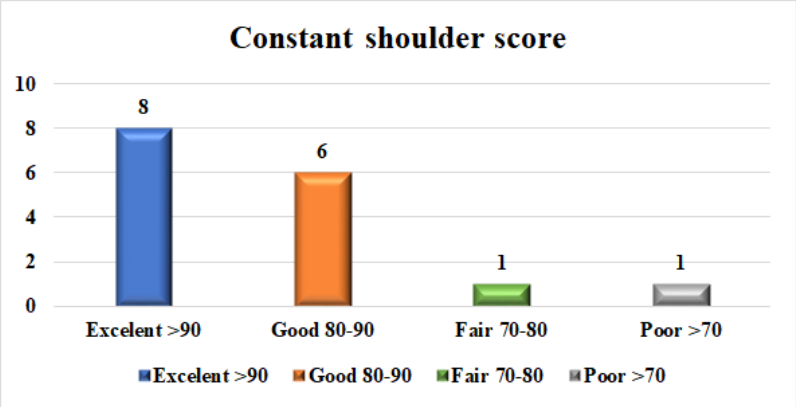

Figure-1: The mean constant shoulder scores of patients

Table-4: Complication of study patients (N=15).

Variables	Frequency	Percentage
Non-union	2	13.33
Superficial infection	3	20.00
Paresthesia over the surgical site	3	20.00
Adhesive capsulitis	4	26.67
Unsatisfactory appearance	8	53.33

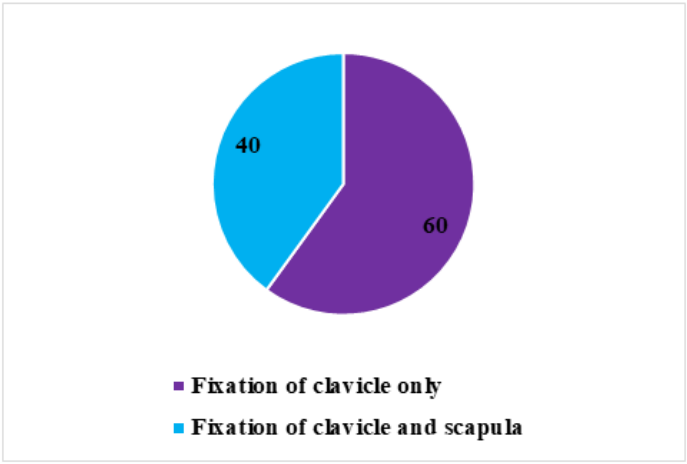

Figure-2: Internal clavicle stability alone in the floating shoulder

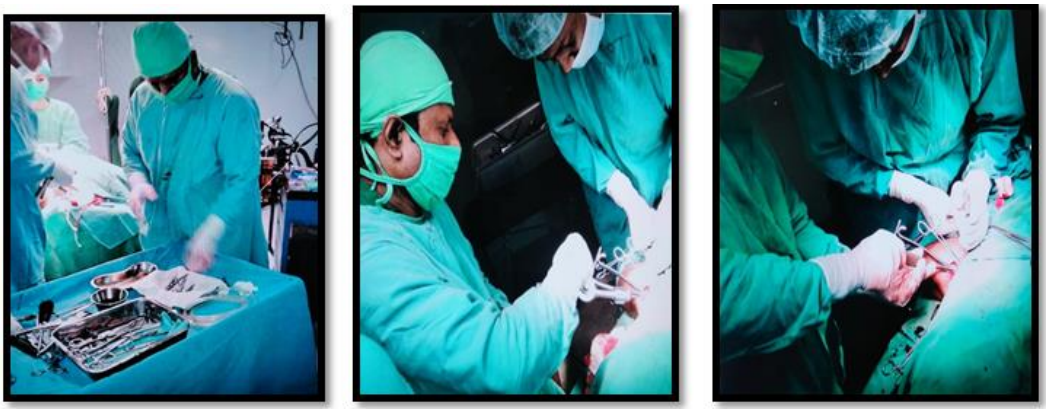

Figure-3: Digital photographs of the patient before and after the operation

DISCUSSION

Clavicle fractures are common, because of their subcutaneous position, accounting for 2.6% of all fractures, more than 75% located in the mid-shaft, after that coming lateral fractures, then rarely medial clavicle fractures [9]. Many conservative treatment ways have been described, but the most common are simple arm slings or figures of eight bandages that have been widely used for better patient satisfaction. Moreover, the figure of eight bandages which associated with higher complications, the some of these complications were axillary pressure sore, and neurovascular compression [10]. Many old studies have shown a high level of patient satisfaction about their healing after non-operative treatment of the clavicle fractures, and even surgical operations had higher rates of nonunion [11-13]. However; many recent studies have demonstrated a higher rate of complications after non-operative treatment, such as non-union, and poor functional outcomes, while the results of operative treatment such as open reduction and internal fixation by plate as primary decision, have improved considerably [14-17]. The numerous muscular and ligamentous forces on the clavicle, such as the deforming force of sternocleidomastoid after fracture, are very strong and cannot be overcome by external supports such as a sling arm or figure-eight bandage [18]. There are many types of fixation in clavicle fractures, in this current study 4 types of implants were performed, reconstruction plate 3.5 mm, locked compression plate 3.5mm, hook plate, and T-plate, 20, 1, 3, 1, respectively, which first two implants used in mid-shaft fracture, and last two in distal clavicle fracture. Overall, the results of this study suggest, that the open reduction and internal fixation of clavicle fracture, were satisfied, which the union rate in our study, was 91 %, which is comparable to that in Naveen *et al*., (2017) [19], which here union rate was 100%, in the study of management of mid-shaft clavicle, its comparative study between operative and non-operative, consisting 60 patients, used the plate (DCP 3.5mm). While another study taking about the management of distal clavicle fracture, Sylvia A Stegeman *et al*., (2013) [20], its union rate was (98%), hook plate or medullary nail fixation was used in this study. In our study, there were ten cases have floating shoulder, in which a clavicle fracture plus scapular neck fracture as an associated injury, (60%) of them have good stability with clavicle fixation alone, and (40%) of cases needed scapula fixation after fixation of the clavicle, to achieve shoulder stability, and our results its comparable with, Yousuf M Khira *et al*., [21], Where its results were, (66.7%) of their cases have stable shoulder after fixation of clavicle alone, in the study includes 12 patient under the title of Treatment of Floating Shoulder: Is Internal Fixation of The Clavicle enough?. We followed up with the patients by using a constant shoulder score. The mean score was (91.86) after 6 months. However, in another study, Chang-Hong Chen *et al*., (2014) [22], its results were 78 ± 6 points at 8 to 12 months. In this study, 33 patients, were stabilized by hook plate, in another study B. M. Naveen (2017) [19], the mean score after 6 months of follow up was (94). The average duration required for union in our study was 10.73 weeks, as compared to B. M. Naveen (2017) [19], where the result in the surgical group was 9.27 weeks. In another study by Zeiad A. Alshameeri *et al*., (2012) [23], under the title of the outcome of surgical fixation of mid-shaft clavicle fractures, the union was achieved in all patients after an average of 13 weeks. Column chart below shows the comparison of union time. Regarding complications in our study, we have a non-union rate (8.3%). The results it's comparable with, Verborgt *et al*., (2005) [24]. And superficial infection in two cases represents (8.3%), while Verborgt *et al*., were 4 cases represent (10%). And also we notify stiffness shoulder in two cases (8.3%). We have no evidence of deep infection, Implant breakage/failure, and Neurovascular problems.

Limitations of the study: There are a few limitations to this study. This is a retrospective study with a small number of cases. Selection bias after excluding patients defaulted from follow-up and incomplete data were unavoidable. Therefore, a prospective study with a large population should be performed in future to ascertain the clinical outcomes of open reduction & internal fixation in case of clavicle fracture.

CONCLUSION AND RECOMMENDATIONS

In conclusion, the conservative treatment remains the treatment of choice for simple clavicle fractures, but for displaced and comminuted fractures surgical intervention is appropriate, especially when considering the overall outcome results. Our study included a small cohort of patients and suggests that the Plate fixation of displaced mid-shaft or distal clavicle fracture reliably restores length and alignment. It resulted in a shorter time to union with low complication rates. For floating shoulder injury, it is important to determine the severity of fracture displacement accurately and the presence or absence of coracoclavicular ligament disruption. Based on those factors, internal fixation of the clavicle alone is satisfactory for stable fractures of the scapula and simple clavicular fractures. Internal fixation of scapular fracture indicated when fixing the clavicle and shoulder is still unstable.

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