

Dynamic Compression Plating Versus Interlocking Nail Procedure for Fracture Shaft of Humerus; A Comparative Study

ZAHIR KHAN¹, MALIK JAVED IQBAL², HAZIQ-DAD KHAN³

¹Assistant Professor Orthopaedic department, Mardan Medical Complex, Mardan

²Professor Orthopaedic department, PIMS Hospital, Hayatabad Peshawar

³Professor Orthopaedic department, Mardan Medical Complex, Mardan

Correspondence to: Haziq-Dad Khan, Email: haziqkhn32@gmail.com

ABSTRACT

Objective: To evaluate the efficacy of dynamic compression plating against interlocking nail technique for the treatment of humeral shaft fractures.

Study Design: Randomized controlled trial

Place & Duration: Department of Orthopedic, Mardan Medical Complex, Mardan for the period of two years from April 2020 to October 2021.

Methods: Fifty six patients (18-65 years old) of both sexes were included in the study because they had a humeral shaft fracture. The patients were randomly split into two groups. Both the dynamic compression plating group (n = 28) and the interlocking nail group (n = 28) received treatment. Radiographic examination both before and after surgery were performed. At the 12-day post-operative, complications following the operation were observed. The NEERs criteria were used to analyse the results of the functional assessments. Follow-up was taken at 6 months postoperatively.

Results: Mean age of patients was 41.46±10.74 years. 42 (75%) patients were males while 25% were females. Road traffic accident was the most common cause found in 37 (66.07%) patients. Mean union time in DCP and INL group was 11.62±3.05 and 13.54±4.73 weeks. Shoulder stiffness was the commonest complication in both groups. At final follow up, in DCP group 24 (85.71%), 2 (7.14%) and 2 (7.14%) patients had excellent, good and fair outcomes, while in group B (INL) 19 (67.86%), 5 (17.86%) and 4 (14.29%) patients had excellent, good and fair outcomes. No significant difference was found in both groups regarding functional outcomes. Patients satisfaction was high in DCP group as compared to INL.

Conclusion: Dynamic compression plating shows better outcomes in term of union time, complications and functional outcomes as compared to interlocking nail Technique.

Keywords: Dynamic Compression Plating, Interlocking Nailing, Fracture Shaft of Humerus

INTRODUCTION

About 3-5% of all fractures are humeral shaft fractures. While appropriate conservative therapy is effective for the vast majority of patients, a small but steady percentage will require surgery for the best possible outcome [1]. Recent publications have aimed to evaluate available treatment options, surgical indications, failure rates, post-operative impairment, and the efficacy of newer implants and procedures [2].

Comfort and patient mobility were the primary focuses of most early therapy techniques. The simplest technique was to use a Sling and Swathe to secure the patient's limb to their body. Comfort was provided, and unity was fostered, but alignment was not well managed. Improved positioning was attained with the advent of the hanging arm cast. Plaster's direct splinting effect and the force of gravity were utilised in this manner to counteract the deforming influences. For humerus fractures, the stiff plastic orthosis with adjustable straps made popular by Sarmiento as functional cast bracing has shown to produce excellent clinical and radiological outcomes [3-5]. While problems are uncommon with nonoperative treatment, the lengthy duration of immobility poses a risk of persistent shoulder stiffness and may be bothersome for the patient [6, 7]. Nonunion after conservative treatment of these fractures occurs in up to 10% of patients and can be very difficult to treat [8-9].

The standard course of therapy is open reduction and internal fixation using plate osteosynthesis or an intramedullary implant. Interlocking nailing of the shaft of the humerus is a recent concept that not only has the advantages of the plating, but also controls rotation and maintains length of the humeral shaft [11-12], so it's a good compromise between the two methods.

When it comes to fixing humeral shaft fractures, we wanted to see how dynamic decompression plates stack up against the more traditional interlocking nailing method.

METHODS

This comparative study was conducted at Department of Orthopedics Mardan Medical Complex, Mardan for the period of two years from April 2020 to October 2021. This study comprised a

total of 56 patients, including both male and female patients ranging in age from 20 to 60 who had presented with a fracture to the shaft of the humerus. After obtaining informed consent from each individual patient, a comprehensive medical history of each patient was reviewed. This included the patient's age, gender, place of residence, the cause of the fracture, the kind of fracture, the side of the fractures, and the severity of the fractures. Patients with complicated fractures, those who suffered from polytrauma and were originally treated with an external fixator, and those who were less than 20 years old were not included in the study.

A random selection was used to divide the patients into two groups. Group A, which consisted of 28 patients, got a technique called dynamic compression plating. Group B, which also consisted of 28 patients, underwent a surgery called interlocking nailing. Radiographic examinations were carried out both before and after the surgical procedure. Twelve days after the operation, post-operative problems were seen. The final follow-up examination was place six months after the operation. The criteria established by the NEERs were utilised in order to evaluate functional outcomes. SPSS 24.0 was used to perform the analysis on all of the data. Mean standard deviation was calculated. Tabulations and numerical representations of the frequencies and percentages were also recorded. In order to analyse the differences in results between the two processes, a Chi-square test was carried out. A statistically significant p-value was determined to be lower than 0.05.

RESULTS

Out of all the patients, 42 (75%) patients were males while 25% were females. Mean age of patients was 41.46±10.74 years. Mean duration of fracture was 28.14±9.26 days. Transverse fractures was the commonest type found in 35 (62.5%) patients, followed by spiral and oblique in 12 (21.43%) and 9 (16.07%) patients respectively. (Table 1)

Majority 37 (66.07%) patients had fracture due to road traffic accident followed by fall in 15 (26.79%) patients and 4 (7.14%) patients had other different causes of fracture which include assault and sports related injuries. (Figure 1)

Table 1: Demographics of all the included patients (n=56)

Variables	Frequency No.	%age
Mean Age (years)	41.46±10.74 years	-
Duration of Fracture (days)	28.14±9.26	-
Gender		
Male	42	75%
Female	14	25%
Types of Fracture		
Oblique	9	16.07%
Spiral	12	21.43%
Transverse	35	62.50%

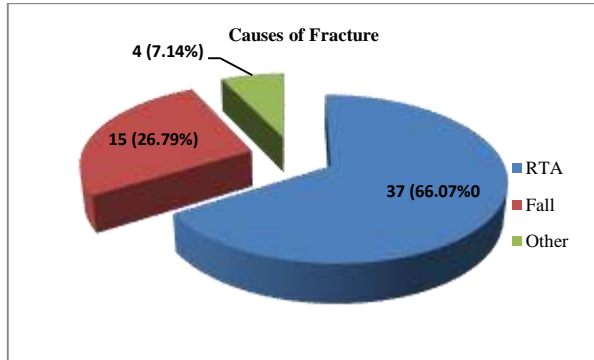


Figure 1: Causes of Fractures among all the patients (n=56)

Mean union time in DCP and INL group was 11.62±3.05 and 13.54±4.73 weeks, a significant difference was observed between both groups with p-value <0.05. According to the complications, shoulder stiffness found in 5 (17.85%) and 7 (25%) patients in Group A and B, none of patients had non-union of bone in both groups, none of patients in Group A had delayed union while in Group B 3 (10.71%) patients had delayed union, none of patient had developed infection, elbow stiffness found in 5 (17.85%) and 4 (14.29%) patients in group A and B. (Table 2)

Table 2: Union time and complications observed after surgery

Variables	Group A	Group B	P-value
Union of bone in weeks			
	DCP	INL	
	Mean	Mean	0.042
	11.62±3.05	13.54±4.73	
<10	15	11	
10 to 15	9	11	
>15	2	4	
Complications			
Shoulder Stiffness	5 (17.85%)	7 (25%)	0.08
Superficial infection	0	0	-
Non-union	0	0	-
Delayed union	0	3 (10.74%)	0.039
Elbow stiffness	5 (17.85%)	4 (14.29%)	>0.05

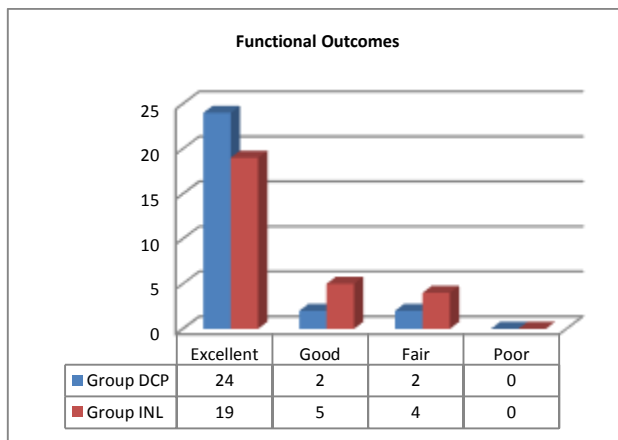


Figure 2: Functional outcomes according to NEERs criteria

At final follow up, in DCP group 24 (85.71%), 2 (7.14%) and 2 (7.14%) patients had excellent, good and fair outcomes, while in group B (INL) 19 (67.86%), 5 (17.86%) and 4 (14.29%) patients had excellent, good and fair outcomes. No significant difference was found in both groups regarding functional outcomes. (Figure 2)

Patients satisfaction was high in DCP group as compared to INL as 26 (92.86%) patients in DCP group were highly satisfied while 22 (78.57%) in INL group were highly satisfied. (Table 3)

Table 3: Patient satisfaction among both groups

Variables	DCP Group A	INL Group B
Satisfied	26 (92.86%)	22 (78.57%)
Not Satisfied	2 (7.14%)	6 (21.43%)

p-value <0.05

DISCUSSION

Patients who have concomitant neurovascular damage, open fractures, accompanying elbow and forearm fractures, or polytrauma are typically advised to have surgical treatment for humeral shaft fractures [12]. At this time, there is neither a consensus nor any authoritative guidelines regarding the surgical protocol for treating humeral shaft fractures. The most common surgical procedures include open reduction and internal fixation (ORIF), intramedullary nail fixation (MIPO), and each algorithm has its own set of benefits and drawbacks. In recent years, there has been a proliferation of comparative research as well as specific meta-analyses [13-14]. We conducted present study to evaluate the effectiveness of two different procedure i.e dynamic compression plating and interlocking nail for the treatment of fracture shaft of humerus. In this regard 56 patients of fracture shaft of humerus were divided equally in to two groups. We found that 42 (75%) patients were males while 25% were females. Mean age of patients was 41.46±10.74 years. Mean duration of fracture was 28.14±9.26 days. Transverse fractures was the commonest type found in 35 (62.5%) patients, followed by spiral and oblique in 12 (21.43%) and 9 (16.07%) patients respectively. These results were similar to many of previous studies in which the average age of patients with these type of fracture was 35 to 50 years and majority of patients whom were seeking treatment were males 65 to 80% [15-16]. A study conducted by MN yousaf et al [17] reported transverse fracture was the most common type of fracture

In present study, majority 37 (66.07%) patients had fracture due to road traffic accident followed by fall in 15 (26.79%) patients and 4 (7.14%) patients had other different causes of fracture which include assault and sports related injuries. Previous studies demonstrated that RTA was the most frequent cause of fracture shaft of humerus [17-18].

In our study we found that Mean union time in DCP and INL group was 11.62±3.05 and 13.54±4.73 weeks, a significant difference was observed between both groups with p-value <0.05. According to the complications, shoulder stiffness found in 5 (17.85%) and 7 (25%) patients in Group A and B, none of patients had non-union of bone in both groups, none of patients in Group A had delayed union while in Group B 3 (10.71%) patients had delayed union, none of patient had developed infection, elbow stiffness found in 5 (17.85%) and 4 (14.29%) patients in group A and B. The overall union rate was 95%. These results were comparable to some previous study in which union of bone rate was 85 to 95% with mean time 10.5 to 14.6 weeks [19-20]. A study conducted by Kumar LLS [21] reported that in DCP group 16.3% patients had shoulder stiffness while 4.7% patients had developed shoulder stiffness in INL group.

Another study by Wang Y et al [22] demonstrated that in plating group overall complications was found in 50% patients while in IML group 23.1% patients developed complications. Arun KN et al [23] reported in their study that only 10% patients showed delayed union who were treated with dynamic compression plating.

At final follow up we found that in DCP group 24 (85.71%), 2 (7.14%) and 2 (7.14%) patients had excellent, good and fair

outcomes, while in group B (INL) 19 (67.86%), 5 (17.86%) and 4 (14.29%) patients had excellent, good and fair outcomes. No significant difference was found in both groups regarding functional outcomes. These results shows similarity to some other studies in which DCP Group had high rate of excellent results with no poor results 80 to 92% as compared to other techniques [24-25].

I present study we also find patients satisfaction about procedure, and found that patients satisfaction was high in DCP group as compared to INL as 26 (92.86%) patients in DCP group were highly satisfied while 22 (78.57%) in INL group were highly satisfied.

CONCLUSION

We concluded that Dynamic compression plating shows better outcomes in term of union time, complications and functional outcomes as compared to interlocking nail Technique. Moreover, Patients satisfaction was high in DCP group as compared to INL.

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