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ORIGINAL ARTICLE

Outcome of Dynamic Compression Plate versus Interlock Intramedullary Nail for Management of Humeral Shaft Fractures

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ABSTRACT

Objective: To compare outcomes of interlock intramedullary nails with Dynamic compression plates for the treatment of humerus shaft fractures in terms of hospital stay time and shoulder Impingement.

Subjects and Methods: In this comparative study, a total number of 74 patients having age 20-60 years who presented with closed and open Gustilo type I or II in middle third of humerus were included. Study was conducted in Islam hospital Sialkot and and Rajib Tayyip Erdogan Hospital, Muzaffargarh from June-2019 to June-2020. Group A (n=37) patients underwent dynamic compression plating (DCP) for treatment of fractures and group B (n=37) underwent interlocking intramedullary nailing (ILN) for humerus shaft fractures. We noted post-operative hospital stay, shoulder impingement and bone union rate in all patients.

Results: The mean of patients included in this study was 42.45 (SD 9.89) years. There were 57 (77.03%) males and 17 (22.97%) females. The mean duration of fracture at the time of surgery was 39.98±7.23 days. Mean hospital stay was 4.72±1.23 days in in group A and 4.89±1.40 days in group B (p-value 0.60). There were 4 (10.8%) patients in group B in whom shoulder impingement occurred but there was no patient in group A with shoulder impingement (p-value 0.04). Complete union occurred in 35 (94.6%) patients in DCP group and in 34 (91.8%) patients in ILN group (p-value 0.64).

Conclusion: Both DCP and ILN are associated with high bone union rates. The complications rate of ILN is higher in comparison to DCP group.

Keywords: Humerus shaft fractures, dynamic compression plates, interlocking intramedullary nailing.

INTRODUCTION

Humerus shaft is a commonly fractured bone accounting for 1-3% all bone fractures.[1] These fractures have a unique profile because these fractures even have very good outcomes even by using non-operative management such as using casts, bracing, and splints.[2,3] Good healing is achieved in more than 90% of cases. The reason for such good outcomes is the reason that humerus is covered by muscles and has a high vascular supply therefore small fractures are healed with good functional and cosmetic results.[4] However, the non-operative methods are not suitable for all humeral shaft fractures. Polytrauma, segmental fractures, open fractures, fractures of unacceptable alignment and failure of non-operative management are communal indications of surgical options for humerus fractures.[5] Non-operative treatment in these type of fractures require a longer immobilization periods, associated with the risk of continued stiffness of shoulder joint and untimeliness for the patients. The non-union in humeral fractures using conservative management occurs in nearly 10% of the cases and treating such patients can be very difficult.[6,7]

So to overcome this, different surgical modalities are in use with the main aim to allow early bone union and thus return to normal life activities.[8] Interlocking intramedullary nails (ILN) and dynamic compression plates (DCP) are the common surgical management options for these fractures. DCP is associated with high union rates and is the recommended management option.[9] However, DCP requires extensive muscle dissection, and carries the risk of nerve damage and mechanical failure.[10] ILN on the other hand is less invasive procedure and is therefore gaining popularity as an alternative to DCP. Moreover, it provides better biomechanics, and load sharing.[10]

Both dynamic compression plates and intramedullary nails are routinely used in our institute for the management of humerus shaft fractures. Therefore, we planned this study to find out the operative outcomes of interlock intramedullary nails versus dynamic compression plates in the treatment of humerus shaft fractures in terms of hospital stay and shoulder stiffness. So that better technique can be used in future for the welfare of our population.

MATERIALS AND METHODS:

This comparative study involving 74 patients was conducted in Orthopedic department of Islam hospital Sialkot and Rajib Tayyip Erdogan Hospital, Muzaffargarh from June-2020 to June-2021. The inclusion criteria was Skeletally mature patients i.e. patients having age 20-60 years, both genders including male and female, patients with closed and open Gustilo type I or II in middle third of humerus and were fit for surgery (on history and medical record). The exclusion criteria were; fractures associated with neuro-vascular injury, patients with gustilo type III open fractures, any other bone and joint disease. Informed consent was signed by each patient and IRB from hospital was obtained.

Patients were randomly divided into two equal groups depending upon the treatment method chosen by them. Group I: was allotted to patients in whom DCP was used for the treatment of humerus shaft fracture and Group II: was allotted to the patients in whom ILN were used for treatment of humerus shaft fracture. All patients were followed for a follow up period of 6 months to see the incidence of shoulder impingement after surgery.

Both procedures were carried out under standard surgical procedures by the senior consultant or in supervision of senior consultant surgeons. Hospital stay time was noted at the time of discharge of patient from the hospital according to the operational definition. Diagnosis of shoulder impingement was made during routine follow up. Shoulder impingement was confirmed if the patient has had a difficulty in reaching his/her hand behind the back, pain with overhead use of the arm, and if feeling weakness in shoulder muscles. Bone union was determined on plain X-rays. Diagnosis of shoulder impingement in a female patient was made in the presence of a female nurse or any other female health care professional keeping in view the ethics of the medical profession. Data regarding confounder variables e.g. age, gender, type of fracture, duration of fracture to surgery and outcomes e.g. hospital stay time and frequency of shoulder impingement was recorded.

Data analysis was carried out using SPSS v20.0. Chi-square test was applied to compare union rate and shoulder impingement rate in DCP and ILN groups. Independent sample t-test was applied to see the difference in hospital stay time in DCP and ILN group, taking P-value ≤0.05 as significant.

RESULTS

The mean age of patients 42.45±9.89 years. There were 57 (77.03%) males and 17 (22.97%) female patients. The mean duration of fracture was 39.98±7.23 days.

Most of the patients were of having closed fractures, there were 59 (79.7%) patients who presented with closed fractures, 10 (13.5%) patients presented with Gustilo type I fractures and 5 (6.8%) patients presented with Gustilo type II fractures. There was no difference in frequency of type of fractures between the groups (p-value 0.31) [Figure 2].

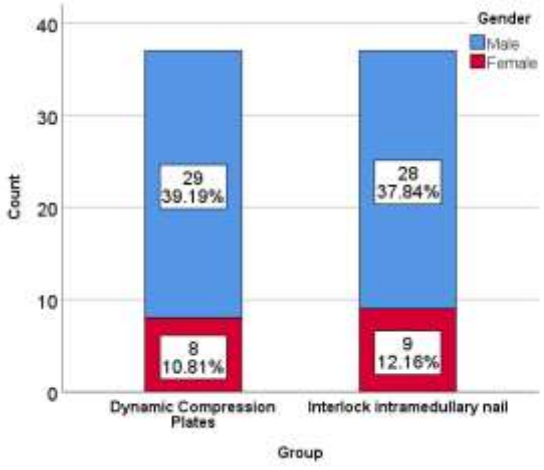

Figure 1. Frequency of Gender.

Mean hospital stay after surgery was 4.81±1.32 days. Mean hospital stay was 4.72±1.23 days in in group A and 4.89±1.40 days in group B (p-value 0.60). Shoulder impingement occurred in 4 (5.41%) patients in total. There were 4 (10.8%) patients in group B in whom shoulder impingement occurred but there was no patient in group A developed shoulder impingement (p-value 0.04). Complete union occurred in 35 (94.6%) patients in DCP group and in 34 (91.8%) patients in ILN group. This union rata was almost similar between the groups with p-value 0.64 (Table 1).

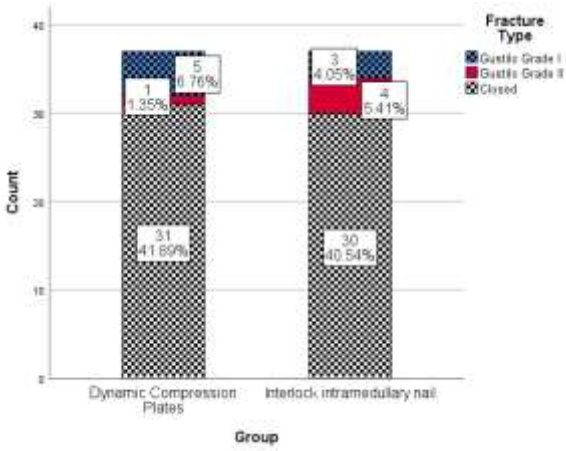

Figure 2. Frequency of Type of Humerus Fractures.

Table 1. Comparison of Study Outcomes.

	DCP (Group A) (N=37)	ILN (Group B) (N=37)	P-value
Hospital Stay			
Mean	4.72	4.89	0.60
SD	1.23	1.40	
Shoulder Impingement			
Yes	0.0	4 (10.8%)	0.04
No	37 (100%)	33 (89.2%)	
Complete Union			
Yes	35 (94.6%)	34 (91.8%)	0.64
No	2 (5.4%)	03 (8.1%)	

DISCUSSION

Humeral fractures in majority of patients are managed non-surgically with good outcomes. the surgical indications of these fractures are open fractures, injury associated with vascular structures, poly trauma and pathologic fractures.[11] The DCP is the widely used surgical option for humeral fractures. However, DCP requires extensive surgical resection and is associated with risks of radial nerve damage and bleeding complications. Theoretically, ILN bypasses these complications and also acts as a load sharing device.[10]

In present study, we compared the dynamic compression plates with interlock intramedullary nails in terms of hospital stay and shoulder impingement rate. In our study, the nailing and plating groups were similar with respect to age, sex, type of fracture, injury surgery interval which indicated that the randomization had been effective. In our study, 77.03% patients were males. Other studies have also found higher proportion of humerus shaft

fractures in male population. In the study of Chaudhary et al.[12] 75% of the included patients were male and in a study by Changulani M et al. 86.9% patients were male.[13]

In our study, there was no significant difference in hospital stay of patients in dynamic compression plate group and nailing group. We found a mean hospital stay of 4.72 days in dynamic compression plates group and 4.89 days in nailing group. Chaudhary et al.[12] also did not found any significant difference in hospital stay in both groups. In their study, mean hospital stay was 4.5 days in plating and nailing group. Raghvendra et al. also found similar results.[14] However, wali et al. found prolonged hospital stay of 14.56 days in plating group and 8.76 days in intramedullary nailing group.[10] These results are contrary to the results of our study.

The major complication of surgical treatment is shoulder impingement, that may be due to reduction in rotatory movements due to prominent nail ends, occurrence of capsulitis or iatrogenic.[15,16] Flinkilla et al. in a study on comparison of functional outcomes of different surgical options of humerus shaft fractures reported that DCP has better flexion and abduction outcomes.[17]

The shoulder impingement occurred in 10.8% patients in ILN group and in 0.0% patients in DCP group in our study. The shoulder impingement rate in the study of McCormack et al. was 30.0% in nailing group and there was no incidence of shoulder impingement in plating group. In the study of Changulani et al. shoulder impingement occurred in 19.0% patients in ILN group and in 0.0% patients in DCP group.[13] These results are similar to the results of our study but in our study the overall shoulder impingement rate was less as compared to these study.

The outcomes of DCP and ILN are similar however, ILN is associated with higher complications rate in post-operative period and it also requires more surgeon's expertise during fixation. So the decision to use ILN should be limited to specific populations group.

CONCLUSION

Both DCP and ILN are associated with high bone union rates. The complications rate of ILN is higher in comparison to DCP group. ILN can be reserved for specific patient populations because it is technically more demanding and has a higher complications rate.

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