

# Dynamic compression plating with interlocking nailing for fracture shaft of humerus in adult: A prospective study

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## Abstract

**Background:** In orthopaedics, a humerus fracture is a frequent yet difficult to treat problem. Unless complicated, these are normally treated non-operatively (with a hanging arm cast, U cast, or U slab). Complete union is not always required since the bone has a dense covering of muscles and blood vessels. The goal of this study was to see if there was a difference between dynamic compression plating (DCP) and intramedullary interlocking nailing in diaphyseal humeral fractures in adults. **Methods:** It was a prospective study undertaken at MGM Medical College and L.S.K. Hospital in Kishanganj, Bihar, in the department of orthopaedics. During the study period of November 2020 to September 2021, a total of 40 cases were enrolled. The participants in the study were randomly assigned to one of two groups. One closed reduction and internal fixation with antegrade intramedullary interlocking nail-group, and one open reduction and internal fixation with dynamic compression plating-group. **Results:** We found that the final outcome in between the groups, comparison of DASH score, maximum number of excellent cases were Dynamic compression plating group. i.e. 80.0%, good-13.3%, Fair was 6.7% respectively. In another Interlocking nailing group excellent cases were found 26.7%, good-33.3%, fair- 26.7% and poor was 13.3% respectively. We have found statistically significant p value -0.028. **Conclusion:** There appears to be a substantial difference in radiological union or rate of union between the two groups; nonetheless, based on complications and functional results, Dynamic compression plating is a good fixation method.

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## INTRODUCTION

Fractures of the humerus shaft account for about 1% to 2% of all bone fractures, and 14% of humeral fractures.<sup>1</sup> It has a bimodal incidence, with a first peak in the third decade of life, primarily in males, due to high energy trauma, and a second peak in the sixth decade, primarily in females, related to moderate trauma. The majority of humeral fractures can be treated without surgery and with a

functional orthosis. Sarmiento demonstrated that prefabricated braces repair fractures consistently and fast, resulting in perfect alignment, early restoration of joint function, and little morbidity. Closed management of humeral shaft fractures is strongly recommended by writers like Balfour and Klenermann<sup>2</sup> unless there are unique indications for operative intervention. Open fractures, unstable fractures (long/spiral), segmental fractures, fractures associated with neurovascular injuries, ipsilateral forearm bone fractures, and pathological fractures are all surgical indications. External fixators, compression plating (ORIF / MIPPO), and intramedullary nails (flexible/rigid, ante grade/retrograde nailing) are all options for the surgeon in these situations. The following are the advantages of open reduction and internal fixation with a dynamic compression plate (DCP): It is possible to do a direct open reduction and stable fixation without rupturing the rotator cuff. It is easier to identify, explore, and preserve the radial nerve because there is no requirement for a C-arm. The limb can be mobilised early,

reducing joint stiffness and muscle contractures. The advantages of closed reduction and internal fixation with the Intramedullary Interlocking Nail (ILN) are as follows: Load sharing implant with minimal surgical intervention (reduced soft tissue injury, infection, and radial nerve palsies).<sup>3</sup>

Early mobilisation, Biological fixation, Rotational and torsional stability The goal of this study is to compare the results of each type of fixation (dynamic compression plating vs. interlocking nailing) for the humerus fracture shaft and look for statistically significant differences between the two procedures.

## METHODS

It was a prospective study conducted at MGM Medical College and L.S.K. Hospital in Kishanganj, Bihar, in the department of orthopaedics. During the study period of November 2020 to September 2021, a total of 40 cases were enrolled. The participants in the study were randomly assigned to one of two groups. One closed reduction and internal fixation with antegrade intramedullary interlocking nail-group, and one open reduction and internal fixation with dynamic compression plating-group. Patients who were treated with anything other than a dynamic compression plate or an interlocking nail were excluded from this study. A 4.5 mm thin dynamic compression plate (DCP) was employed in the first group, and a standard intramedullary interlocking nail (IMN) was used in the second group. Plate osteosynthesis is the gold standard in the treatment of humeral shaft fractures. A high rate of unionisation, a low rate of issues, a shorter hospital stay, and a rapid return to work are all associated to plating.

The most commonly used dynamic compression plates were used to treat the fractures in this series. Intramedullary Interlocking Nail Fixation: In patients with multiple trauma, osteoporosis, pathological fractures, and 3sc segmental fractures, closed medullary nailing of humeral shaft fractures is increasingly becoming the treatment of choice. The plating procedure based on Henry's anterolateral approach was used in patients with fractures of the upper and middle thirds of the humerus shaft. A posterior approach was used in patients with fractures in the lower thirds of the shaft. Surgery was performed within a week after being admitted to the hospital after achieving surgical fitness. At each follow-up appointment, clinical evaluations were performed to assess surgical wound healing, pain, tenderness at the fracture site with free shoulder and elbow motion, fracture stability, and clinical union. Clinical union was confirmed when the fracture site was stable and pain-free. X-rays were taken at each follow-up consultation to ensure fracture union. The time it took for clinical and radiological union was documented. If no clinical or radiological evidence of union was detected by 16 weeks after injury, the fracture was defined as delayed union, and if no clinical or radiological signals of union were found by 32 weeks after injury, the fracture was classed as nonunion. Frequency tables, cross tabulations, and figures are used to present the findings. Categorical data is expressed as a percentage of a frequency. The mean and standard deviation of continuous data with a normal distribution are shown. The significance of study parameters on a categorical scale between two groups was determined using the U t test, Chi-square, or Fisher Exact test. P-values of less than 0.05 were deemed significant.

## RESULTS

**Table 1:** Age Distribution among study population.

Age in Year	Dynamic compression plating(n=15)		Interlocking nailing (n=15)	
	No	%	No	%
20 – 25	5	33.3	6	40.0
26 – 40	6	40.0	6	40.0
41 – 60	3	20.0	1	6.7
>60	1	6.7	2	13.3
Total	15	100	15	100.0
Mean and SD Value	36.452±14.23		41.211±11.25	
P Value	0.359			

We have found Maximum number of the cases belongs to 26-40 years of age group. i.e. 12 (40.0%)cases. 20-25 years of age group belongs to 11(36.7%) cases. 41-60 years of age group belongs to 4(13.3%) of cases and 03(10.0%) cases belongs to >60 years of age groups. The Mean age of Dynamic compression plating group was-36.452±14.23 and The mean age of Interlocking nailing group was 41.211±11.25. There was no significant difference of age in between the groups. P value was 0.359

**Table 2:** Sex distribution among study population.

Sex	Dynamic compression plating(n=15)		Interlocking nailing (n=15)		Total(n=30)	
	No	%	No	%	No	%
Male	10	66.7	11	73.3	21	70.0
Female	5	33.3	4	26.7	9	30.0
Total	15	100	15	100.0	30	100
Statistical Analysis	Chi-square- 0.1587 P Value- 0.690					

Between the groups male cases was predominantly high i.e. 21(70.0%) cases, and female cases was 9(30.0%). Out of 21 cases males were 10 cases belong to Dynamic compression plating group and 11 cases were Interlocking nailing group. And out of 9 female cases 5 cases were Dynamic compression plating group and 4 cases were Interlocking nailing group. The chi square value was 0.1587- and and p value was 0.690 respectively.

**Table 3: Time taken for fracture union**

Union Time (Weeks)	Dynamic compression plating(n=15)		Interlocking nailing (n=15)		Total(n=30)	
	Mean	SD	Mean	SD	Mean	SD
Time taken for Union	21.45	±4.12	26.21	±3.11	23.45	±3.89
U t test	0.002					
p Value						

The Dynamic compression plating group was found a minimum time for union i.e. 17 weeks and maximum 26 weeks with a mean and SD time for union was 21.45±4.12 weeks and for Interlocking nailing group union time was 23 weeks minimum and 29 weeks maximum with a mean and SD time was 26.21±3.11 weeks. The mean average union time was 23.45±3.89 weeks. We have found significant p value -0.002

**Table 4: Final outcome**

Final outcome	Dynamic compression plating(n=15)		Interlocking nailing (n=15)		Total(n=30)	
	No	%	No	%	No	%
Excellent	12	80.0	4	26.7	17	56.7
Good	2	13.3	5	33.3	7	23.3
Fair	1	6.7	4	26.7	4	13.3
Poor	0	0.0	2	13.3	2	6.7
Total	15	100	15	100.0	30	100
Statistical analysis	Chi-square- 9.0857 P Value- 0.028					

We found that the final outcome in between the groups, comparison of DASH score, maximum number of excellent cases were Dynamic compression plating group. i.e. 80.0%, good-13.3%, Fair was 6.7% respectively. In another Interlocking nailing group excellent cases were found 26.7%, good-33.3%, fair- 26.7% and poor was 13.3% respectively. We have found statistically significant p value -0.028.

## DISCUSSION

We've found The age range of 26-40 years old accounts for the majority of the cases. i.e. 12 (40.0%) of the cases. The age range of 20-25 years old accounts for 11 (36.7 percent) of the cases. 4 (13.3 percent) of the cases are in the 41-60 year old age group, while 03 (10.0 percent) are in the >60 year old age group. Interlocking nailing had a mean age of 41.211±11.25 and Dynamic compression plating had a mean age of 36.452±14.23. There was no discernible age difference between the groups. The significance level was 0.359. Patients in the DCP group ranged in age from 22 to 65 years old, with a mean age of 39.38 years, according to another study by Naveen P *et al.*<sup>4</sup> The interlocked group's age varied from 23 to 84 years old, with a mean age of

35.87. The t value was 0.741 with a P value of 0.464 (P>0.05) when the Student't' test was used, indicating that there was no statistically significant difference in the age distribution of the two groups. Male cases were prominent in both categories, with 21 (70.0 percent) male cases and 9 female instances (30.0 percent ). Ten of the twenty-one male cases belonged to the Dynamic compression plating group, while eleven instances belonged to the Interlocking nailing group. Out of the nine female cases, five had Dynamic compression plating and four had Interlocking nailing. The chi square value was 0.1587, whereas the p value was 0.690. In a similar study, Akshay H *et al.*<sup>5</sup> found that bone quality and fracture characteristics were critical factors in deciding treatment options. 27 patients had

fractures from car accidents, 3 from domestic injuries, 7 from falls from a height, and 1 from a sports injury. In 23 cases, the right arm was implicated, whereas 15 patients had the left arm involved. The Dynamic compression plating group had a minimum union time of 17 weeks and a maximum of 26 weeks, with a mean and SD time of  $21.45 \pm 4.12$  weeks, and the Interlocking nailing group had a minimum union time of 23 weeks and a maximum of 29 weeks, with a mean and SD time of  $26.21 \pm 3.11$  weeks. The average length of time spent in union was  $23.45 \pm 3.89$  weeks. We discovered a strong p value of  $-0.002$ . In a comparison of DASH scores, we discovered that the Dynamic compression plating group had the highest number of good cases. i.e. 80.0 percent, good-13.3 percent, and fair (6.7%), respectively. Another Interlocking nailing group found 26.7 percent great cases, 33.3 percent good cases, 26.7 percent fair cases, and 13.3 percent poor cases. The p value of  $-0.028$  was judged to be statistically significant. The average DASH score of the entire series was  $36.614 / 100$ , according to Naveen P *et al.* [4]. (Lower the score better the function). The average DASH score in the DCP group was 24.666, while it was 48.562 in the interlocking nailing group. The results were statistically significant with respect to DASH score in both groups since the P value was 0.010 (0.05). 11 people had great results, 9 had acceptable results, 8 had average results, and 6 had bad results out of 34. Six patients were treated with dynamic compression plating and five were treated with interlocking nailing among the 11 patients who had outstanding results. Five patients were treated with dynamic compression plating and four were treated with interlocking nailing among the nine patients who had good results. Five of the eight patients who had fair results were treated with dynamic compression plating, while three were treated with interlocking nailing.<sup>6</sup> Of the six patients who had poor results, two were treated with dynamic

compression plating and four were treated with interlocking nailing. Statistical analysis revealed that the dynamic compression plating group outperformed the interlocking nailing group by a factor of 0.010 (0.05, significant) and, when percentages are taken into account, the dynamic compression plating group outperformed the interlocking nailing group.

## CONCLUSION

Plating of humerus shaft fractures appears to be a beneficial fixation strategy based on problems reported and functional results recorded, since there appears to be a substantial difference in radiological union or rate of union between the two groups. Based on complications and functional results, Dynamic compression plating is a good fixation method.

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