

## ORIGINAL RESEARCH

# A Comparative Study of diaphyseal fracture of humerus managed with compression plate versus interlocking nail.

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### ABSTRACT

**Background:** Diaphyseal fractures of humerus accounts for 3% of all fractures<sup>1</sup>. Most of the fractures occur in young individuals because of increasing road traffic accidents. These diaphyseal fractures have been treated conservatively since ages but surgery is indicated for optimum outcome. With the advancement of the surgical techniques and instruments, operative management of humeral shaft fractures has increasingly become accepted<sup>2,3</sup>. The optimal method of humeral shaft fracture fixation remains in debate. This study was conducted to evaluate the outcome of the results of intramedullary nailing and dynamic compression plate fixation. **Materials and methods:** A prospective, comparative study was conducted in Department of Orthopaedics, Chirayu Medical College And Hospital, Bhopal M.P from December 2021 to January 2023 consisted of 40 cases of fracture shaft humerus divided in two groups of 20 each to which closed interlocking nail and open dynamic compression plate was done. Study results were evaluated with ASES score. The results were analysed on the parameters of sex, age, mode of trauma, rate of healing, functional outcome, complications and morbidity. **Results:** The study included patients 18 years and above in age. The age of the patients ranged from 18- 63 years. The commonest age group affected was 18-25 years and maximum number of patients were below the age of 45 years. The mean age affected was 37.7 years. Male predominance of 65% seen with male:female ratio 1.9:1, more common on left side 55%, road traffic accident (RTA) in 88% cases as common mode of injury followed by fall, most common AO type A3 37.5% cases, interlocking nail group showed 60% cases as excellent result 30% cases showed good results and 10% showed fair results and with compression plating 90% cases had excellent result and 10% cases showed good results. **Conclusion:** We observed no significant difference in union rates in both groups. Patient's who was treated with interlocking nailing achieves early union. Interlocking nailing had lower chances of radial nerve injury, however significant shoulder stiffness was noted in that group. Compression plating is standard for diaphyseal shaft humerus and has less post-operative morbidity.

**Keywords:** Humerus diaphysis, Interlocking Nail, Dynamic Compression Plate (DCP).

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### INTRODUCTION

Diaphyseal fractures of humerus accounts for 3% of all fractures<sup>1</sup>. Most of the fractures occur in young individuals because of increasing road traffic accidents. These diaphyseal fractures have been treated conservatively since ages but surgery is indicated for optimum outcome. The optimal method of humeral shaft fracture fixation remains in debate. Two techniques under investigation include intramedullary nailing and dynamic compression plate fixation. Both techniques provide satisfactory results but plating requires extensive dissection, radial nerve protection and it may fail in osteoporotic bone. With

the advancement of the surgical techniques and instruments, operative management of humeral shaft fractures has increasingly become accepted<sup>2,3</sup>. Advantages of intramedullary nailing included less invasive surgery, an undisturbed fracture hematoma and use of a load sharing device support. The phenomenon success of interlocking nailing in long bones like femur and tibia is not seen in humerus. According to recent studies<sup>4,5</sup> the preferred method of fixation & humeral by dynamic compression plate. The purpose of this study is to compare the outcomes of each method of fixation (dynamic compression plating and interlocking nailing) for the fracture shaft

of humerus and to know if there is any statistically significant difference in the results of these two methods.

## MATERIALS AND METHODS

A prospective, comparative study was conducted in CHIRAYU MEDICAL COLLEGE AND HOSPITAL (M.P.) between December 2021 and January 2023. The study consists of 20 cases (group A) of fracture shaft humerus treated with closed intramedullary nailing and 20 cases (group B) treated with dynamic compression plating. In order to eliminate bias in allocation and to create similar baseline values, subjects were randomly assigned to one of the groups: nailing or plating. The inclusion criterion was patient aged 18 years and above, acute injuries (< 5 days) with closed diaphyseal humeral fractures. Patients under 18 years of age, fracture of upper and lower ends of humerus, patients treated conservatively, patients who lost to follow up, compound fractures, all Pathological fractures, refusal of patient, pregnant females were excluded from the study. All patients with diaphyseal humerus fractures admitted to CHIRAYU MEDICAL COLLEGE AND HOSPITAL Bhopal were evaluated thoroughly clinically, radiologically, stabilized and classified according to the A.O. classification. Other necessary radiological and blood investigations, pre-anaesthetic checkup and workup done then planned for surgical management under general anaesthesia.

In interlocking nail group, antegrade nailing was done in all the patients using the deltoid splitting approach, with the patient in inclined position. The entry portal was just lateral to the articular surface of the humeral head and medial to the greater tuberosity. Guide wire passed and fracture was reduced under fluoroscopic guidance. One screw was inserted proximally and distally. In compression plating group, antero-lateral or posterior approach was used depending on the fracture pattern. To fix all fractures a 4.5 mm dynamic compression plate (DCP) or limited- contact DCP (LC- DCP) was used. At least six points of cortical fixation on either side of the fracture was done. Post-operatively, arm was supported in a sling pouch for a period of two week. Elbow range of motion exercises started on the next day of surgery and shoulder range of motion exercises were started as soon as the patient was pain free. Regular follow up done at OPD with proper rehabilitation protocol. Suture removal done on 12<sup>th</sup> post-op day. Proper clinical and radiological assessment done at 2 weeks, 6 weeks, 3 months, 6 months, 12 months, 18 months and in between if required. On every visit, clinical and radiological sign of union recorded. Final functional outcome was measured at the end of six months post-operatively in all the patients in whom union was achieved<sup>5</sup>. Final functional assessment was done using the American Shoulder and Elbow Surgeons score (ASES). Statistical analysis was performed using statistical package of social sciences SPSS version 11.

Descriptive statistics were applied in mean  $\pm$  standard deviation (SD) for quantitative data and number (%) for qualitative data. Non parametric data was analyzed using Mann-Whitney U-test and parametric unrelated data with unpaired t- test. Statistical significance was determined at 95% level of confidence. Results were considered statistically significant in the *p*-value was less than 0.05.

## RESULTS

The study included patients 18 years and above in age. The age of the patients ranged from 18- 63 years. The commonest age group affected was 18-25 years and maximum number of patients were below the age of 45 years. The mean age affected was 37.7 years. Male predominance of 65% seen with male:female ratio 1.9:1, more common on left side 55%, road traffic accident (RTA) in 88% cases as common mode of injury followed by fall, most common AO type A3 37.5% cases, interlocking nail group showed 60% cases as excellent result 30% cases showed good results and 10% showed fair results and with compression plating 90% cases had excellent result and 10% cases showed good results.

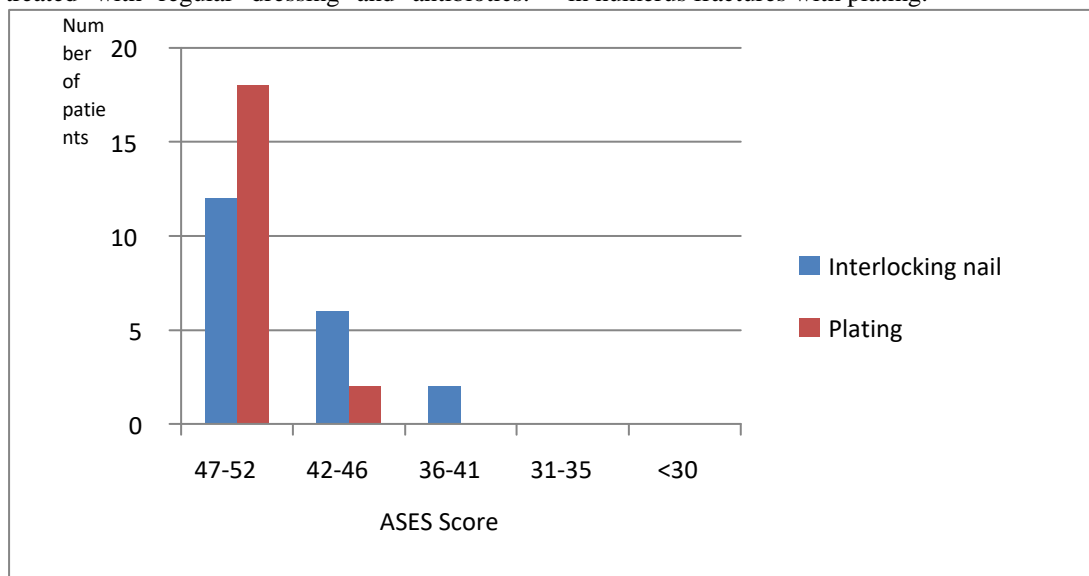
In our study 40 patients of fracture shaft humerus admitted in Orthopaedics Department of CHIRAYU MEDICAL COLLEGE AND HOSPITAL Bhopal(M.P). Out of 40 patients, 20 were undergone interlocking nail and 20 were treated with compression plating. The age of the patients ranged from 18- 63 years. The commonest age group affected was 18-25 years and maximum number of patients were below the age of 45 years. The mean age affected was 37.7 years. Male predominance of 65% seen with male:female ratio 1.9:1, more common on left side 55%, road traffic accident (RTA) in 88% cases as common mode of injury followed by fall, most common AO type A3 37.5% (Transverse type) cases followed by B2 30% (bending wedge) and A2 20% (oblique type). 16 patients had associated injuries like fracture shaft of femur and tibia, distal end radius fracture, fracture both bone forearm, head injury and abdomen injury. Majority of the patients were operated within three days with average union time in interlocking nail group was 11 weeks; average union time in compression plating group was 12.5 weeks<sup>6</sup>. In our study 1 case of superficial infection was seen (3.3%) case which was treated with regular dressing and antibiotics. None of the patient suffered deep infection. 2 case of iatrogenic radial nerve palsy<sup>7</sup> was observed which recovered over a period of 4 months. Shoulder stiffness was more noticed in cases treated with intramedullary nail. No case of non-union was observed. No case of elbow stiffness was encountered. The most significant complication of intramedullary nailing was shoulder stiffness 12.5% and of plating was iatrogenic radial nerve palsy 5%.

## DISCUSSION

In the study of comparison of compression plating vs. interlocking nail in fracture shaft humerus 20 cases in

group A and group B were treated with interlocking nail and compression plating respectively with age of youngest patient 18 years and oldest 63 years with mean age 37.7. Similar trend was seen in a series of Lal et al<sup>8</sup> in which mean was 39.5 years and Chacha et al<sup>9</sup> average being 36.3 years. In this study, male:female ratio was 1.9:1. Reddy et al<sup>10</sup> study showed M:F ratio was 7:3. The more involvement of right side with 60% cases of road side accidents, 33.3% cases of fall from height and 3.33% cases due to railway injuries. Superficial infection was seen in 1 (3.3%) case which was treated with regular dressing and antibiotics.

None of the patient suffered deep infection<sup>11</sup>. 2 (6.7%) case of iatrogenic radial nerve palsy was observed which recovered over a period of 4 months. Shoulder stiffness was more noticed in cases treated with intramedullary nail<sup>5</sup>. The most significant complication of intramedullary nailing was shoulder stiffness 12.5%. In study of Suh JT et al<sup>12</sup> where 50% of patients shows shoulder stiffness. No case of non-union and elbow stiffness was encountered in both group. In our study, 100% cases achieve union. Ikpeme<sup>13</sup> noted 100% union of shaft fractures with I.L.N. Willis MP et al<sup>14</sup> reported union rate of 100% in humerus fractures with plating.



The final outcome of both the modalities of treatment were measured using ASES score. In interlocking nailing 60% of the patient had excellent upper limb functional status at the end of the treatment with ASES 47-52. 30% had good and only 10% had had ASES 36-41 which implies to fair functional upper limbs. For plating 90% of patient had ASES Score 47-52 which implies excellent upper limb function. Only 10% had ASES Score 42-46 which is also a good functional upper limb. This 10% attributed to where patient mostly had comminuted fracture.

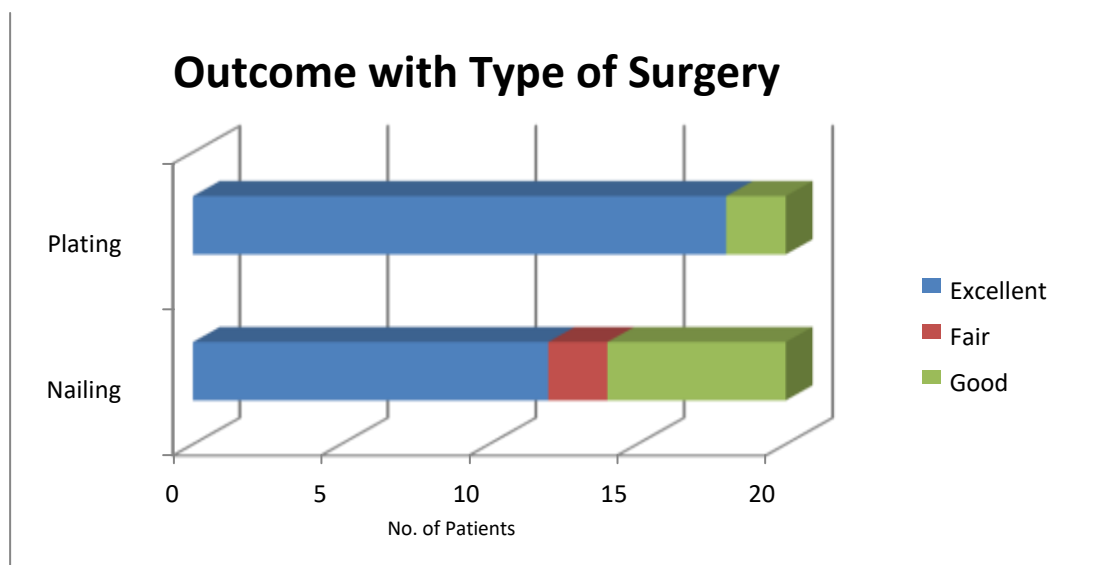


**Fig. 1 Radiographs of interlocking nailing at a)Pre-op, b)Post-op c) fracture union**



**Fig .2: Radiographs of compression plating at a)Pre-op, b)Post-op c) & d) fracture union.**

The final outcome of both the modalitie of treatment were measured using ASES score.Excellent result was observed in 18 patients (60%) of plating and 12 patients (40%) of the plating group. Patients of plating group showed better results than nailing group<sup>15,16</sup>.



Outcome with the type of surgery

**CONCLUSION**

We observed no significant difference in union rates in both groups. Patient’s who was treated with interlocking nailing achieves early union. Interlocking nailing had lower chances of radial nerve injury, however significant shoulder stiffness was noted in that group. Compression plating is standard for diaphyseal shaft humerus and has less post-operative morbidity<sup>17,18</sup>.

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