



COMPARISON OF MANAGEMENT OF FRACTURE OF MID ONE THIRD OF SHAFT OF HUMERUS BY INTERLOCKING NAIL VERSUS PLATE

Orthopaedics

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ABSTRACT

Introduction- Fractures of the humeral shaft are quite common in orthopaedic injuries. These fractures are managed by conservative and surgical intervention. These fracture are surgically managed by intramedullary nailing and plating. **Objective-** To compare the union rate of the fractures and functional outcome between the patients treated with Plate Osteosynthesis and those treated with Interlocking Nailing for fracture mid one third of shaft of humerus. **Methods-** Hospital based prospective comparative study of 60 patients with humeral shaft fractures treated with Intramedullary interlocking nailing and Plate osteosynthesis according to inclusion criteria. **Result-** Using Rodriguez Merchan Criteria, In interlocking nailing group 22 patients experience excellent to good outcome, while 6 patients have fair and two have poor functional outcome while in plating group all patients achieve excellent to good outcome. **Conclusion-** Plate osteosynthesis was superior than intramedullary nailing for treating fracture of mid one third shaft of humerus. There were excellent and good functional outcome in plating group compared to interlocking nailing group. Complications were lesser in plating group compared to nailing group.

KEYWORDS

MID ONE THIRD HUMERAL SHAFT, INTRAMEDULLARY NAILING, PLATE OSTEOSYNTHESIS, FUNCTIONAL OUTCOME

INTRODUCTION

Fractures of the humeral shaft are quite common, constituting around 20% of all humeral fractures and approximately 3-5% of all fractures in general ⁽¹⁾. 60% of all humeral shaft fractures occur in the middle third of the humerus shaft, which is the most prevalent location for fractures ⁽²⁾. There is a bimodal presentation, with the greatest occurrence due to fall in elderly patient of age group 60-80 years and in the younger population of age group 21-30 years, due to high intensity trauma like road traffic accident or sports injury ^(3,4).

Various approaches can be considered for treating humeral shaft fractures, including conservative management and operative management ^(4,5). Surgical intervention for fractures of the humeral shaft is warranted in cases such as open fractures, segmental fractures, fractures caused by underlying pathology, fractures accompanied by vascular damage, bilateral fractures of the humerus, cases of multiple trauma, radial nerve paralysis following fracture manipulation, neurological deficits resulting from penetrating injuries, fractures presenting with unacceptable alignment, and instances where conservative treatments have proven ineffective ⁽⁶⁾. Intramedullary nailing (IMN) either anterograde or retrograde are advantageous as it reduces further injury to the soft tissues and protect the integrity of the periosteum but also have disadvantages such as poor antirotation ability and shoulder impact ^(7,8) and restrict shoulder movement. Plate fixation is one of the most favored surgical technique due to high degree of union, low rate of complication, and quick restoration to function. It produces good outcomes, it necessitates careful radial nerve shielding and significant soft tissue dissection. The plate is considered as less effective in osteoporotic bone ^(4,9). There is ongoing debate regarding the most effective approach to fixing fractures of the humeral shaft.

Current study was planned to compare the union rate of the fractures and functional outcome between the patients treated with Plate Osteosynthesis and those treated with Interlocking Nailing for fracture mid one third of shaft of humerus.

MATERIAL AND METHODS

This is a prospective comparative study of 60 patients with humeral shaft fractures treated with Intramedullary interlocking nailing and Plate osteosynthesis conducted at the Department of Orthopaedic Muzaffarnagar Medical College & Hospital, Muzaffarnagar during 2021-2023 period.

Inclusion Criteria:

1. Fresh fractures of humeral shaft.
2. Patients aged above 18 years
3. Fractures of mid one third of shaft of humerus,
4. Angulation more than 15 degrees.

Exclusion Criteria

1. Age less than 18 years,
2. Fractures involving proximal and distal one third humerus.

Patients were divided into two groups, plating group or interlocking nailing, 30 patients in each group. Patients admitted in the Orthopaedic Department was subjected to clinical examination and investigation to ascertain their fitness for surgery and anaesthesia. All patients of mid one third shaft of humerus fractures coming to Emergency will be evaluated in detail for fracture of shaft of humerus, neurological status of limb, other bony injury and injury of other system. First aid in the form of splintage, traction, intravenous fluids and analgesics will be given and BLS, ATLS protocols are applied.

Surgical Technique

IM Nailing Technique

The patient is placed in a supine position on a fracture table, with a sandbag positioned under the shoulder. An antegrade interlocking method was employed with an intramedullary nail of the Russell-Taylor type, with efforts made to reduce rotator cuff injury during nail insertion. Using a lateral deltoid splitting approach aided by the image intensifier, create a diagonal incision starting from the front and acromion side corner. After the separation of the deltoid muscle along with fibers, that area where anterior & middle thirds of the muscle meet. After rotator cuff is exposed and incised at the supraspinatus tendon following deltoid splitting. Position initially guidewire passed behind the tendon of biceps and carefully guide it using fluoroscopy to the correct location. Then, progress the proximal reamer while ensuring the protection of the rotator cuff. Place the bead-tipped guidewire in the fracture after realigning it using the reduction device. Then, proceed to ream the humeral to a fixed diameter (usually 1-1.5 mm greater than nail's diameter) by gradually employing larger reamers.

Plating

Posterior approach

A posterior approach was used to make an incision along the midline that stretched from the tourniquet to the olecranon's tip in parallel to the humerus. Dissection proceeds until the triceps fascia is reached, at which point the fascia is cut. The nerve radial is found and released

both prox. and dist., with the lateral intermuscular septum being cut open for three centimeters to facilitate nerve mobilization. The triceps muscle is cut away from the periosteum, revealing the bone break site. Once the fractured ends are cleaned and debrided, they are realigned and secured using bone clamps. Afterward, it is stabilized using a 4.5mm broad LCP/DCP or narrow DCP/LCP in either neutralization or compression mode.

The postoperative outcomes of interlocking nailing and plating procedures were compared during follow-up using the criteria established by Rodriguez-Merchan in 1995.

Statistical Analysis & Software

Suitable statistically significant test will be used for statistical analysis along with IBM SPSS-ver.20 Software.

RESULTS

In this study, age range from 21-80 years with a mean of 40 years in interlocking nail and 37 years in plate osteosynthesis group. Majority of patients in both groups fall within the age range of 21 to 40 years, comprising 60-70%. Majority in the interlocking nailing and plating groups, who experienced a humeral shaft fracture are male (75%). Majority of cases is road traffic accidents, accounting for 73% in the interlocking nailing group and 87% in the plating group. 57% cases in interlocking nailing group and 63% patients in plating group exhibit involvement of right side. In interlocking nailing group 57% patients and in plating group 67% cases have type A fracture and rest have type B fracture.

Table 1. Variables In Both Groups

Variables	Interlocking nail (n=30)	Plating (n=30)
Age (years)	40	37
Male: Female	23:7	22:8
Side of injury Right:Left	17:13	19:11
Mode of injury RTA:FALL	22:8	26:4
AOTYPE (Type A:B)	17:13	20:10
Complications		
Non union	2 (7%)	-
Shoulder impingement	2 (7%)	-
Infection		1(3%)

Patients achieved union in 19 weeks in plating group and 21 weeks in interlocking nailing group. In the Interlocking Nailing group, 93% of fractures achieved union without requiring a secondary procedure. Two cases that did not unite was attributed to distraction at the fracture site, necessitating planned exchange nailing. In plating group all patients achieved union. In plating group all patient had excellent to good outcome. In interlocking nailing group 22 patients experience excellent to good outcome, while 6 patients have fair and two have poor functional outcome.

Table 2. Comparison Of Time Of Union In Both Groups

Time taken for union	Plating	Interlocking nail
Minimum	16 weeks	16 weeks
Maximum	22 weeks	26 weeks
Average	19 weeks	21 weeks

Post operatively two patients encountered shoulder dysfunction result from impingement caused by the proximal migration of the nail. Among patients treated with Plate Osteosynthesis, one patient have superficial infections.

DISCUSSION

In this study Predominant number of patients are male 77% in the interlocking nailing and 73% in plating group. Our results are in agreement with the study of **Changulani et al.**⁽¹⁶⁾ who found that in the nailing group, 86.9% were male and 13.1% were female, while in the plating group, 79.2% were male and 20.8% were female. Age range from 21-80 years with a mean of 40 years in interlocking nail and 37 years in plate osteosynthesis group.

Primary cause of injury for the majority of cases is road traffic accidents. Our results are in agreement with other study carried out by **K Singiseti and M Ambedkar**⁽⁴⁾ who found that common cause is road traffic accident. 25 patients in plating group and 14 patients in nailing group showed union in less than 16 weeks. In study of **K**

Singiseti and M Ambedkar⁽⁴⁾ there was a significant difference between interlocking nail and plating group with earlier union in plating group. two cases (7%) that did not unite was attributed to distraction at the fracture site, necessitating planned exchange nailing. In study conducted by **AB Putti et al.**⁽¹¹⁾ it was demonstrated that patients who underwent Interlocking Nailing treatment exhibited a non-union rate of 8%. In studies of **McCormack et al**⁽¹²⁾ **M Changulani et al**⁽¹⁰⁾, **Subhash Puri et al**⁽¹³⁾ the incidence of non-union in interlocking group was 9.5%, 14.3%, 13.3% respectively.

30 patient in plating group and 22 patients in interlocking nail group have excellent and good results. In interlocking nailing group fair and poor results are observed as compared to plating group. The results of present study are comparable to study conducted by **Rathod et al.**⁽¹⁴⁾ and **K Singiseti and M Ambedkar**⁽⁴⁾. In interlocking nailing, two cases developed non-union (7%), necessitating planned subsequent exchange nailing. Among patients treated with Plate Osteosynthesis, all patients achieved union within an average duration of 16 weeks. In the Interlocking Nailing group, two patients encountered shoulder dysfunction result from impingement caused by the proximal migration of the nail. Among patients treated with Plate Osteosynthesis, two patients have superficial infections that resolved with parenteral antibiotics. In study conducted by Rathod et al⁽¹⁴⁾, post operatively 13 complication has been observed in interlocking nailing group and 6 complication has been observed in plating group. In study conducted by James P. Stannard et al.⁽¹⁵⁾ revealed that approximately 20% of patients experienced mild to moderate shoulder pain. Likewise, Chapman et al.⁽⁸⁴⁾ found a notable decrease in shoulder mobility within the Nailing group.

CONCLUSIONS

Plate osteosynthesis was superior than intramedullary nailing for treating fracture of mid one third shaft of humerus. There were excellent and and good functional outcome in plating group compared to interlocking nailing group. Complications were lesser in plating group compared to nailing group.

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