

Original research paper

# Management of humeral shaft fracture: A comparative study between interlocking nail and dynamic compression plating

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## Abstract

**Introduction:** There is a debate about the choice of operative intervention in humerus shaft fractures requiring surgical intervention. A prospective, comparative study of management of acute humeral shaft fractures treated by antegrade interlocking nail fixation and dynamic compression plating was undertaken over a period of three years. Twenty patients of interlocking nailing and sixteen patients of plating were included after considering the inclusion and exclusion criteria. Functional scoring criteria were used for postoperative assessment and the average follow-up period was one year. A higher rate of excellent and good results and a tendency for earlier union was seen with the plating group in our series.

**Objectives:** Comparative assessment of results of plating and Intramedullary Nailing in a rural set up so that proper management techniques can be provided for better functional outcome and minimum complications.

**Materials and Methods:** This prospective study was conducted over a period of two years on 30 patients with closed acute humeral shaft fracture requiring operative interventions.

**Results:** 40 percent of cases were in the age group 31-40 years with males outnumbering females. Motor vehicle accidents (65.3%) were most frequent cause. Right humerus was more frequently (65%) involved. Maximum patients (95%) were operated within 4-6 days after injury. Out of 15 patients of plate group complications were: Infection-4.6%; delayed union-11.3%; shoulder movement restriction-12.6%; elbow movement restriction-7.6%. Out of 15 patients of nail group complications were: Splintering of fracture end-7.1%; infection-5.9%; delayed union-26.2%; shoulder movement restriction-12.3%; elbow movement restriction-6.4%; shoulder pain-45.6%. Maximum number of fractures (74.0% in plating group and 61% in nailing group) clinically united in the interval of 11-14 weeks. Maximum number of patients had radiological union in period of 12-16 weeks (76.3% plate group and 68.6% nail group). There was no significant difference between the two groups. On functional assessment, excellent results were obtained in 11 patients in locking plate group and 13 patients in locking nail group.

**Conclusions:** Dynamic compression plating is the excellent method of stabilizing transverse

diaphyseal fractures of humerus. The compression produced at the fracture site by the plate promoting osteosynthesis. But the technique is not suitable for segmental fractures, pathological fractures, comminuted fractures, gross osteoporosis, non-union and fractures much proximal or distal to shaft. Introduction of interlocking nailing has largely solved problems faced by the standard dynamic compression plating technique. An advantage of humerus interlocking is that even after developing non-union day to day activities could be performed whereas in cases with loosening of screws it was difficult.

**Keywords:** Dynamic compression plate, fracture, humerus, interlocking nail

## Introduction

Fractures of the humeral shaft are commonly encountered by the orthopaedic surgeons. According to Mast *et al.* (1975) and Varley (1995), the diaphysis or shaft can be defined as that part of the humerus situated between the superior margin of pectoralis major tendon insertion and 2 cm above the olecranon fossa. The causes in younger patients are commonly represented by high energy trauma (car accident or sports injury), while in older patients by lower energy trauma (such as an accidental fall), but they are often associated with osteoporosis. The goals of humeral shaft fracture management are to establish union with acceptable humeral alignment and restore patients to their prior level of function. Many methods have been described for the management of humeral shaft fractures. Good-to-excellent results have been reported in most series of humeral shaft fractures. Treated by closed or with open reduction and internal fixation. Both patient and fracture characteristics, associated injuries, soft tissue status, and fracture pattern need to be considered to select appropriate treatment. Fractures of the shaft of humerus have been treated conservatively by reduction and subsequent immobilization of the arm, and successful healing occurs in 90% of cases.

The methods include the hanging cast, functional brace, Velpeau dressing, and shoulder spica cast. Many options were available to treat fractures conservatively, but taking into consideration pitfalls of it, an era of fixation was evolved, the aim of which was early restoration of joint motion and return to normal physiological function and minimal morbidity. While there are several methods of operative intervention for diaphyseal fractures of humerus, the internal fixation methods can be broadly grouped as plating or intramedullary nailing techniques. Interlocking nailing is preferable in comminuted, segmental and pathological fractures while plating may be the preferred option where radial nerve exploration is contemplated infection and nonunion and radial nerve palsy are general concerns suggested in the plating group. Selecting the right implant for internal fixations remains a controversy, so we want to conduct a prospective, comparative study for the management of diaphyseal fractures of the humerus to find the ideal mode of surgical management with their functional outcome.

## Materials and Methods

The present study was conducted in the Department of Orthopaedics Surgery, from January 2020 to December 2021 on 30 patients, 15 each group having diaphyseal fractures and shaft humerus, after obtaining approval from hospital ethics committee.

## Inclusion criteria

The following criteria were included in the study:

1. Age of the patient more than 18 years.
2. Patient presenting within 2 weeks of injury.

3. All closed type of displaced diaphyseal fractures of the humerus.
4. Patients with Grades 1 and 2 open diaphyseal fractures of humerus presenting within 8 h of injury.

### Exclusion criteria

The following criteria were excluded from the study:

1. Refracture of diaphyseal fractures of humerus.
2. Pathological fractures.
3. Neglected diaphyseal fractures of humerus
4. Fractures within 4 cm from proximal and distal end of humerus.
4. Grade 3 compound diaphyseal fractures of humerus.
5. Age of the patient <18 years.

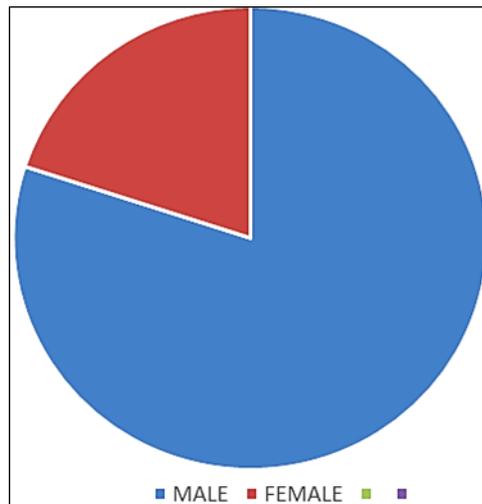
All protocols and procedures applied in this study were as per the Guidelines of Ethics Committee of this institution.

### Results

40 percent of cases were in the age group 31-40 years with males outnumbering females. Motor vehicle accidents (65.3%) were most frequent cause. Right humerus was more frequently (65%) involved. Maximum patients (95%) were operated within 4-6 days after injury. Out of 15 patients of plate group complications were: Infection-4.6%; delayed union-11.3%; shoulder movement restriction-12.6%; elbow movement restriction-7.6%. Out of 15 patients of nail group complications were: Splintering of fracture end-7.1%; infection-5.9%; delayed union-26.2%; shoulder movement restriction-12.3%; elbow movement restriction-6.4%; shoulder pain-45.6%. Maximum number of fractures (74.0% in plating group and 61% in nailing group) clinically united in the interval of 11-14 weeks. Maximum number of patients had radiological union in period of 12-16 weeks (76.3% plate group and 68.6% nail group). There was no significant difference between the two groups. On functional assessment, excellent results were obtained in 11 patients in locking plate group and 13 patients in locking nail group. All cases, except one from each group returned to their previous occupation. Both these cases developed non-union. They were able to perform daily activities but not able to resume their occupation. Thus the functional result was good in 92.6% of cases and poor in 7.4% of cases of either group. In this study complications were also observed. 2 of them were superficial infections that responded well to antibiotics and dressings and later healed well and united. 2 cases developed discharging sinuses and subsequently infected union. Later the plate was removed and sinus tract excised. The sinus tract healed but left unsightly scar marks over the arm. Only one patient of group-A developed deep seated infection and subsequent non-union. 2 cases of group A developed shortening ranging from 1.2 cms to 3cms. All these cases were cases of old non-union with sclerotic bone ends which had to be nibbled and refreshed. Shortening developed in 2 cases of group-B. One non-union was seen in each group. While the screws of one dynamic compression, went loose, no implant failure occurred in interlocking nails. One case of group-A developed axillary nerve injury, which might be attributed to the fact that the incision extended 4-6 cm beyond the acromion process. Only one case in group-B developed 10o angulation.

**Table 1:** Sex Ratio Involved in Humerus Fracture

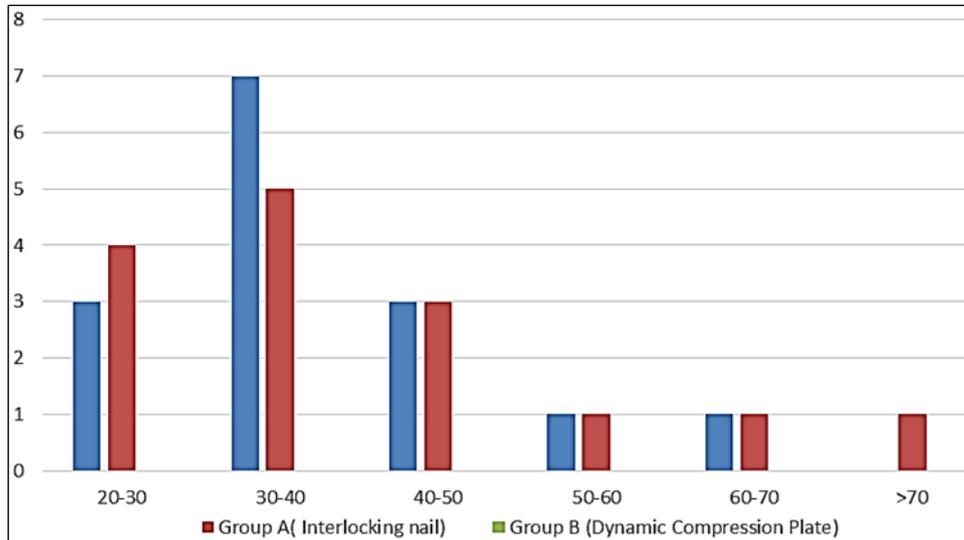
Male	80
Female	20
Total	100



**Fig 1:** Sex Ratio Involved in Humerus Fracture

**Table 2:** Age distribution

Age distribution in years	Group A (Interlocking nail)	Group B (Dynamic Compression Plate)
20-30	3	4
30-40	7	5
40-50	3	3
50-60	1	1
60-70	1	1
>70	0	1
Total	15	15



**Fig 2:** Age distribution

**Discussion**

For patients requiring surgical treatment of mid shaft humeral fractures, locking plating and interlocking intramedullary nailing both provide statistically comparable results but a higher rate of excellent and good results and a tendency for earlier union was seen with locking plating group in the present series. There are various surgical approaches mentioned in the literature for open reduction and internal fixation of mid shaft fracture of humerus, but in our

study, we have done plating of mid shaft humeral fractures through anterolateral approach, reflecting the biceps medially with minimum soft tissue dissection and periosteal stripping and with utmost care for radial nerve, specially at spiral groove. In our study 1 post-operative radial nerve palsy occurred. Humerus nailing was done in all cases of our study through ante grade method. Rotator cuff injury was prevented as much as possible. In our study 1 Axillary nerve palsy occurred, fracture ends splintering occurred. So healing was not a problem and cases of early healing were more in plate group. Results of our study were comparable to the study by Singiseti K *et al.* in 2010. The aim of internal fixation of fracture of humerus is to attain and maintain a stable reduction so as to mobilize the patient's limb in the shortest possible time and that the fracture healing is ensured. Dynamic compression plating has stood the test of time a good method of stabilizing transverse diaphyseal fractures of humerus. The plate (dynamic compression plate) produces a compression at the fracture site promoting osteosynthesis. But the technique is not suitable for segmental fractures, pathological fractures, comminuted fractures, gross osteoporosis, non-union and fractures much proximal or distal to shaft. Introduction of interlocking nailing has largely solved problems faced by the standard dynamic compression plating. The advantages of a stable reduction maintained by a humeral interlocking nail must be weighed against the technical problems and the need for prolonged fluoroscopy to target the distal holes.

## Conclusion

Dynamic compression plating has stood the test of time as an excellent method of stabilizing transverse diaphyseal fractures of humerus. The plate produces a compression at the fracture site promoting osteosynthesis. But the technique is not suitable for segmental fractures, pathological fractures, comminuted fractures, gross osteoporosis, non-union and fractures much proximal or distal to shaft. Introduction of interlocking nailing has largely solved problems faced by the standard dynamic compression plating technique. An advantage of humerus interlocking is that even when non-union developed daily activities could be performed whereas in cases with loosening of screws it was difficult to do so.

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