



## Comparative Study of Humerus Shaft Fracture Treated with Plating V/S Interlocking Nail: a Study of 250 Patients

### KEYWORDS

humerus shaft, fracture, plating, nails

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**ABSTRACT** *Introduction: Fractures of the humeral diaphysis comprise approximately 3% of all fractures. The proportion of these fractures being treated conservatively reportedly varies from 33% to 95%. Intramedullary fixation of humeral diaphyseal fractures as well as compression plating or external fixation in open fractures are described.*

*Material & Method: All patients with fractures of shaft of humerus that met the criteria for operative interventions (intramedullary interlocking nailing and dynamic compression plating) presenting to the department of Orthopaedics in the study period and giving informed consent were included in the study. a total of 250 patients, 125 in each group were enrolled.*

*Results & Conclusion: The mean age of the patients in the IMN and PLT groups were 43 years and 44 years respectively and were not significantly different ( $p=0.83$ ). The ratios of males: females were 18:5 and 16:8 in the IMN and PLT group respectively. Intramedullary interlocking nailing is less invasive procedure with advantages of less blood loss as compared to plating however dynamic compression plating showed better outcome in our study for fracture shaft of humerus.*

### Introduction:

The humeral shaft extends from the lower edge of the pectoralis major insertion to the supracondylar ridge of the distal humerus.<sup>1</sup> The fracture which occurs in this space is called humeral shaft fracture, which is found in a proportion of about 3% of all the fractures.<sup>2</sup> 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 often associated with osteoporosis.<sup>3</sup> AO classification is based on simple criterions: it divides the humeral shaft fractures in 3 main groups: type A (simple fractures with two fragments), type B fractures (three fragments), type C (complex fractures with four or more fragments or comminuted). Epidemiologically, type A fractures appear to be prevalent with 63% of cases, while type B and C are found respectively in 26.2% and 10.4% of cases.<sup>4</sup>

Fractures of the humeral diaphysis comprise approximately 3% of all fractures. The proportion of these fractures being treated conservatively reportedly varies from 33% to 95%. Intramedullary fixation of humeral diaphyseal fractures as well as compression plating or external fixation in open fractures are described.<sup>5</sup> Lin reported a near 100% union rate in 73 fractures treated with either locked intramedullary nails or compression plates and screws. He noted a significantly shorter operative time, less blood loss, and a lower complication rate with locked intramedullary nails.<sup>6</sup> Chapman et al. found no difference in outcome or complication rate in an 84-patient, prospective, randomized study comparing Russell-Taylor locked intramedullary nails with 4.5-mm compression plates and screws. The optimal method of humeral shaft fracture fixation remains in debate.<sup>7</sup>

Nonsurgical treatment results in higher incidence of union and fewer complications than open reduction and internal fixation. Though most heal well with conservative care, a small but consistent number will require surgery for opti-

mum outcome. There are specific indications where operative treatment has been shown to improve the outcome of the 2 fracture or the patient.<sup>8</sup>

Open reduction and internal fixation with a plate were gold standard in old days. Though high rate of union (about 95%) mentioned in established data, a proportion of post-operative complications as the radial nerve related injuries or infection are well known. As to other long bone fracture like femoral or tibial shaft fracture, open reduction and internal fixation with interlocking nail seems to be another good choice.<sup>9</sup>

Many randomized, controlled trials have reported dynamic compression plate (DCP) fixation and IMN fixation of humeral shaft fractures. However, it is unclear whether one method is more effective than the other. 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 & Methods:

All patients with fractures of shaft of humerus that met the criteria for operative interventions (intramedullary interlocking nailing and dynamic compression plating) presenting to the department of Orthopaedics in the study period and giving informed consent were included in the study. a total of 250 patients, 125 in each group were enrolled.

The inclusion criteria were: (1) humeral shaft fractures which required operative intervention and were treated with interlocking or plating procedures, and (2) patients of age of 18 years or more. The exclusion criteria were: (1) the patient was aged less than 18 years, (2) pathological fractures, (3) segmental fractures, (iv) fractures within 4cm of proximal and distal end of humerus, and (5) patients

who were lost to follow-up or at early stages of follow-up at the time of completion of the study (minimum follow up of six months required). All patients had appropriate clinical and radiological assessment before a decision to offer surgical intervention was made. All fractures were classified according to the AO classification.

All patients were advised on immediate postoperative shoulder and elbow exercises and radiographs were taken at regular intervals during follow-up. After discharge, regular follow-up is arranged at the 1, 2, 4, 8, 12th week and then monthly, and radiography is arranged at the 4, 8, 12th week and then every 3 months. Healing is defined as both clinically free from pain or movement at the fracture site, and radiographically callus formation observed. During the follow-up, union time and complications are all recorded for both groups.

Qualitative data are expressed as frequency and percentage. Fisher's exact test or chi-square test was used to examine the relationship between qualitative variables. Normally distributed continuous data are presented as mean±SD and were compared using t tests.

### Results:

The mean age of the patients in the IMN and PLT groups were 43 years and 44 years respectively and were not significantly different ( $p=0.83$ ). Five Grade I fractures and two Grade II fractures were seen in the PLT group. There was no significant difference in the distribution of closed versus open fractures in the two groups ( $p=0.49$ ). Similarly the difference in the distribution of Grade I versus Grade II open fractures in the two groups was also not significant statistically ( $p=0.58$ ).

The indications for surgery in the two groups were not significantly different ( $p=0.92$ ). The Table 1 shows the distribution of indications of surgery in the two groups:

**Table 1: showing the indications of surgery in the two groups**

Indications	Nails	Plates
Failure of closed treatment	75	75
Open fractures	25	30
Polytrauma	25	20

The Table 2 shows the levels of fracture in the two groups. The distribution of fractures at various levels in the two groups were not significantly different ( $p=0.99$ ).

**Table 2: showing the levels of fracture in the two groups**

Level of fracture	Nails	Plate
Upper third	40	45
Middle third	70	50
Lower third	15	30

There were no significant differences in pain in both the groups. Nailing and plating groups had no significant difference in tenderness at fracture site on attempted angulation till 12 weeks follow up but the tenderness was significantly less in plating group at 18 and 24 weeks follow up

which showed faster union. Dash score gradually improved in both nail and plate group but Dash score was significantly higher in plating group at 6, 12, 18 and 24 weeks follow up. Five patients had stiffness of shoulder in nailing group. This shows better functional outcome in nailing group.

There was no significant difference between radiological evidence of union at 6, 12 and 18 weeks follow up in the two groups but plating group showed better ( $p$  value 0.023) radiological evidence of union at 24 weeks follow up. There was implant failure in 1 patient. Radiologically four cortices union was only 50% in nailing group while it was 80% in plating group in 24 weeks postoperative time.

Post-operative complications included two wound infections in the PLT group. There was no wound infection in the IMN group. However this difference was not statistically significant ( $p=0.49$ ). One patient in the PLT group developed Radial nerve palsy post-operatively. However this was temporary and recovered after 3 months of surgery. Though no postoperative radial nerve palsies were seen in the IMN group, this difference was not statistically significant ( $p=1.00$ ).

### Discussion:

Though most humeral shaft fractures can be managed non-operatively, operative intervention is indicated in specific circumstances. Controversy still exists regarding the method of internal fixation of these fractures.<sup>10</sup> Our study compares the clinical, functional and radiological outcome between locked intramedullary nailing and plating in patients with fractures of the shaft of humerus. Our indications for operative treatment of fractures of the shaft of humerus were similar to the other authors. We excluded patients with grade III open fractures from the study like McCormack et al. Lin J and Chapman JR et al however had included grade III open fractures in their study.

Humeral shaft fractures have been reported to be more common in males with a peak incidence in the third decade. Road traffic accident was a common cause for such fractures in our and other similar studies. A variation in epidemiological features of humeral shaft fractures is noted with different geographical locations.<sup>11</sup>

The nailing and plating groups were similar with respect to age, sex, dominant limb, injured limb, mode of injury, immediate treatment, injury surgery interval which indicated that the randomization had been effective.<sup>5</sup> Many randomized, controlled trials have reported DCP fixation and IMN fixation of humeral shaft fractures. To the current authors' knowledge, there has been no consensus on the efficacy of these 2 methods. Therefore, they evaluated and compared the IMN and the LCP for the treatment of humeral shaft fractures with regard to intraoperative blood loss, operative time, duration of hospital stay, union time, union rate, functional outcomes, and incidence of complications. Of these, intraoperative blood loss, operative time, duration of hospital stay, and average union time were significantly less in the IMN group compared with the LCP group.

### Conclusion:

Intramedullary interlocking nailing is less invasive procedure with advantages of less blood loss as compared to plating however dynamic compression plating showed better outcome in our study for fracture shaft of humerus.

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