

## COMPARISON OF HUMERAL INTERLOCKING NAIL AND COMPRESSION PLATING IN PATIENTS WITH FRACTURE OF SHAFT OF HUMERUS

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### Abstract

**Background:** To compare humeral interlocking nail and compression plating in fracture of shaft of humerus patients. **Materials and Methods:** One hundred eight patients involving fracture of shaft of humerus of both genders were randomized into two groups of 54 each. Group I underwent internal fixation by dynamic compression plating, with or without bone grafting and group II underwent internal fixation by humeral interlocking nail. Parameters such as mode of injury, range of elbow joint movements, and complications, Rodriguez-Merchan criteria (1995) of outcome in both groups were recorded. **Result:** Group I comprised of 30 males and 24 females and group II had 28 males and 26 females. Range of movement pre-operatively in group I was 8-132 degree and in group II was 4-130 degree and post-operatively in group I was 4-136 degree and in group II was 5-134 degree. The mode of injury was RTA in 37 in group I and 40 in group II, fall in 10 in group I and 8 in group II and violence in 7 in group I and 6 in group II. The difference was significant ( $P < 0.05$ ). Complications observed were superficial infection 1 in group I and 1 in group II, deep infection 2 in group I and 3 in group II, implant failure 1 and in group II each, shortening seen in 3 in group I and 2 in group II, non-union 1 in group I and 1 in group II. Outcome was excellent 17 in group I and 15 I group II. Good in 33 in group I and 31 in group II, fair in 6 in group II and poor in 4 in group I and 2 in group II. **Conclusion:** Dynamic compression plating found to be superior method of stabilizing shaft fractures of humerus. It had less post-operative complications and better treatment outcome.

## INTRODUCTION

Fractures of the humeral shaft are commonly encountered by orthopaedic surgeons, accounting for approximately 3% of all fractures. It is generally agreed that most fractures of humeral shaft are treated best non-operatively, although there are indications for primary or secondary operative treatment in some situations.<sup>[1,2]</sup>

Treatment methods for these injuries continue to evolve as advances are made in both non-operative and operative management.<sup>[3]</sup> Plate fixation results in high rates of union but requires extensive open surgery with stripping of the soft tissues from the bone. It also provides less secure fixation, especially in osteoporotic bone and if crutch walking is required.<sup>[4,5]</sup> However, some studies recommend IMN as a standard surgical method through either antegrade or retrograde nailing, whereas other studies report that IMN may lead to damage of the shoulder joint and a poor union rate.<sup>[6]</sup> Therefore,

the efficacy of plate fixation and IMN is still debated. Open reduction and internal fixation (ORIF) with plates and screws continues to be considered the gold standard for surgical treatment given its lower complication rate and shorter time to union over intramedullary nailing.<sup>[7]</sup> Good to excellent results have been reported in most series of humeral shaft fractures treated closed or with open reduction and internal fixation.<sup>[4]</sup> Both patient and fracture characteristics, associated injuries, soft tissue status and fracture pattern need to be considered to select appropriate treatment.<sup>[8]</sup> We performed this study to compare humeral interlocking nail and compression plating in fracture of shaft of humerus patients.

## MATERIALS AND METHODS

After considering the utility of the study and obtaining approval from ethical review committee, we selected one hundred eight patients involving

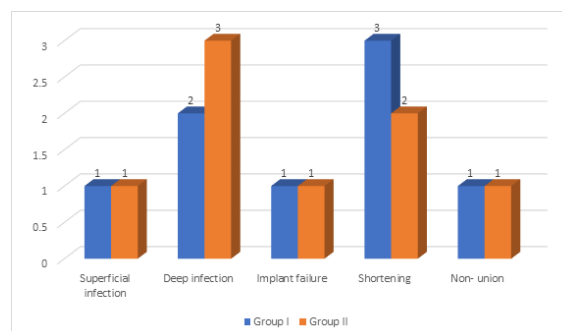
fracture of shaft of humerus of both genders. Patients' consent was obtained before starting the study.

Data such as name, age, gender etc. was recorded. A routine history taking was taken. A thorough clinical examination and pre-operative assessment was done in all patients. Patients were randomized into two groups of 54 each. Group I underwent internal fixation by dynamic compression plating, with or without bone grafting and group II underwent internal fixation by humeral interlocking nail. All underwent pre-operative and post-operative radiographic examinations. Parameters such as mode of injury, range of elbow joint movements, and complications in both groups were recorded. Rodriguez-Merchan criteria (1995) were used as excellent, good, fair and poor outcomes was based on scores of shoulder and elbow movements along with pain and disability after the procedure. Results were compiled and subjected for statistical analysis using Mann Whitney U test. P value less than 0.05 was set significant.

## RESULTS

Group I comprised of 30 males and 24 females and group II had 28 males and 26 females. [Table 1]. Range of movement pre- operatively in group I was 8-132 degree and in group II was 4-130 degree and post- operatively in group I was 4-136 degree and in group II was 5-134 degree. The mode of injury was

RTA in 37 in group I and 40 in group II, fall in 10 in group I and 8 in group II and violence in 7 in group I and 6 in group II. The difference was significant ( $P < 0.05$ ) [Table 2].



**Figure 1: Assessment of complications**

Complications observed were superficial infection 1 in group I and 1 in group II, deep infection 2 in group I and 3 in group II, implant failure 1 and in group II each, shortening seen in 3 in group I and 2 in group II, non- union 1 in group I and 1 in group II. The difference was significant ( $P < 0.05$ ) [Figure 1].

Outcome was excellent 17 in group I and 15 I group II. Good in 33 in group I and 31 in group II, fair in 6 in group II and poor in 4 in group I and 2 in group II. The difference was significant ( $P < 0.05$ ) [Table 3].

**Table 1: Patients distribution**

Groups	Group I	Group II
Method	Dynamic compression plating	Humeral interlocking nail
M:F	30:24	28:26

**Table 2: Comparison of parameters**

Parameters	Variables	Group I	Group II	P value
Range (in degree)	Pre- op	8- 132	4-130	0.04
	Post- op	4-136	5-134	
Mode of injury	RTA	37	40	0.01
	Fall	10	8	
	Violence	7	6	

**Table 3: Outcome of treatment (Rodriguez-Merchan criteria)**

Outcome	Group I	Group II	P value
Excellent	17	15	0.05
Good	33	31	
Fair	0	6	
Poor	4	2	

## DISCUSSION

This study compared humeral interlocking nail and compression plating in fracture of shaft of humerus patients.<sup>[9,10]</sup> The newly developed locking compression plate (LCP) system, which has specially designed combinations of holes that allow the system to be used both as a conventional DCP and as a locked internal fixator, can offer improved fixation stability over conventional DCP.<sup>[11]</sup>

Anterior plating is a simple, safe, and effective treatment for humeral shaft non-union.<sup>[12,13]</sup> It does not require radial nerve visualization or extensive soft tissue dissection, and the healing time is similar to that of other methods used for treating humeral shaft non-union. This is an alternative approach to osteosynthesis of humeral shaft non-union, in which the plate is placed on the anterior surface of the bone.<sup>[14-16]</sup>

We included 108 patients with fracture of shaft of humerus. Group I comprised of 30 males and 24

females and group II had 28 males and 26 females. Patients in group I underwent internal fixation by dynamic compression plating, with or without bone grafting and in group II internal fixation by humeral interlocking nail. Fan et al,<sup>[17]</sup> in their study 60 patients with humeral shaft fractures were randomized to undergo surgery with an intramedullary interlocking nail (n=30) or locking compression plate (n=30). Intraoperative blood loss, operative time, and hospital stay in group A (intramedullary interlocking nail) were significantly lower than those in group B (locking compression plate). No statistically significant difference was found regarding the union rate, mean constant score, and mean ASES score between the groups. The average union time was found to be significantly lower for the intramedullary interlocking nail compared with the locking compression plate. The incidence of complications such as radial nerve palsy was found to be higher with the locking compression plate compared with the intramedullary interlocking nail.

Our results showed that range of movement pre-operatively in group I was 8-132 degree and in group II was 4-130 degree and post-operatively in group I was 4-136 degree and in group II was 5-134 degree. The mode of injury was RTA in 37 in group I and 40 in group II, fall in 10 in group I and 8 in group II and violence in 7 in group I and 6 in group II. Singiseti et al,<sup>[18]</sup> in their study males accounted for 77% and no obvious side predilection was noted. Road traffic accidents accounted for about 85% of the fractures followed by domestic and other causes. All of the fractures could be grouped as A3 and B2 of AO classification, and 64% involved the middle third of the humerus shaft. Preoperative radial nerve palsy was seen in four cases (11.11%). All cases of preoperative radial nerve palsy recovered completely following stabilisation, indicating a neuropraxia type of injury. The radial nerve was explored to check its integrity in only two cases where open reduction was done for plating. No postoperative radial nerve palsy was seen in the interlocking nailing group. Postoperative radial nerve palsy was seen in one case in the plating group (6.25%).

Complications observed were superficial infection 1 in group I and 1 in group II, deep infection 2 in group I and 3 in group II, implant failure 1 and in group II each, shortening seen in 3 in group I and 2 in group II, non-union 1 in group I and 1 in group II. Ghosh et al,<sup>[19]</sup> found that age group 31-40 years had 40% of cases with males outnumbering females. The most frequent cause was motor vehicle accidents (63.3%). In 66.6% of cases, right humerus was more frequently involved. Results showed that 40% were operated within 4-6 days after injury. Complications in plate group reported were infection-6.6%; delayed union-13.3%; shoulder movement restriction-13.3%; elbow movement restriction-6.6%. Complications in nail group reported were splintering of fracture end-6.6%;

infection-6.6%; delayed union-26.6%; shoulder movement restriction-13.3%; elbow movement restriction-6.6%; shoulder pain-46.6%. 73.3% in plating group and 60% in nailing group had clinically united in the interval of 11-13 weeks. 73.3% plate group and 66.6% nail group had radiological union in period of 12-16 weeks. There was no significant difference between the two groups. On functional assessment, excellent results were obtained in 22 patients (73.3%) in locking plate group and 18 patients (60%) in locking nail group.

Outcome was excellent 17 in group I and 15 in group II. Good in 33 in group I and 31 in group II, fair in 6 in group II and poor in 4 in group I and 2 in group II. Hashib et al,<sup>[20]</sup> in their study 15 cases underwent internal fixation by humeral interlocking nail (Group-A) and 14 cases underwent internal fixation by dynamic compression plating (Group-B). The functional result was good in 92.3% of cases and poor in 7.7% of cases of either group. 4 cases in group B (30.8%) managed by dynamic compression plating developed infections. One patient (7.7%) of group A developed deep seated infection and subsequent non-union. 3 cases of group A (23.1%) developed shortening ranging from 1.5 cm to 4 cm. Shortening developed in 2 cases (15.4%) of group-B. One non-union was seen in each group. While the screws of one dynamic compression (7.7%) went loose, no implant failure occurred in interlocking nails. 1 patient (7.7%) of group A developed axillary nerve injury, which might be attributed to the fact that the incision extended 6-7 cm beyond the acromion process.

## CONCLUSION

Dynamic compression plating found to be superior method of stabilizing shaft fractures of humerus. It had less post-operative complications and better treatment outcome.

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