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A COMPARATIVE STUDY BETWEEN NAILING AND PLATING IN PATIENTS OF HUMERUS SHAFT FRACTURE

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ABSTRACT

Background: Humeral shaft fractures represent 1–3% of all fractures and predominantly affect young adults and elderly individuals. These injuries, if not managed effectively, can lead to significant functional impairment. While conservative methods are effective in selected cases, surgical interventions are often required for better alignment, stability, and early mobilization. Among surgical options, Dynamic Compression Plating (DCP) and Intramedullary Nailing (IMN) are the most commonly used techniques. **Aim & Objectives:** To evaluate and compare the functional outcomes and complication rates between interlocking nailing and plating in the treatment of humeral shaft fractures. Specifically, the study aimed to compare DASH score improvement and the incidence of associated complications between both groups. Methodology: This prospective clinical comparative study was conducted over 18 months on 60 patients at Varun Arjun Medical College. Patients were equally divided into two groups (n=30 each) treated with either IMN or DCP. Outcomes were assessed using the DASH score and complication rates. Statistical analysis was done using SPSS v25.0 with significance set at $p<0.05$. **Results & Conclusion:** Plating showed better functional outcomes with a lower mean DASH score (12.9 ± 3.9) than nailing (15.2 ± 4.7, $p=0.045$). Shoulder stiffness was significantly higher in the nailing group (20%) compared to plating (6.7%, $p=0.042$), while other complications were comparable.

INTRODUCTION

Humeral shaft fractures account for approximately 1–3% of all fractures and typically affect two age groups: young adults (21–30 years) due to high-energy trauma (e.g., vehicular accidents, sports injuries), and older adults (60–80 years) from low-energy falls, often associated with osteoporosis. These fractures impair upper limb mobility and, if inadequately managed, may lead to significant morbidity. Treatment options include conservative and surgical methods, with the choice depending on fracture characteristics and patient health.

Conservative treatment, using hanging arm casts or functional braces, promotes fracture healing without surgical risks like infection or nerve injury. However, it is less effective in cases with poor alignment, non-union, or neurovascular involvement, where surgery becomes necessary. Non-surgical methods also carry risks of malunion and functional impairment if the reduction is inadequate.

Surgical intervention is indicated for non-union, complex or displaced fractures, associated injuries (e.g., floating elbow), or patient factors such as obesity or polytrauma. Surgery enables anatomical reduction, enhances healing, and allows early mobilization but carries risks like infection, nerve damage (especially radial nerve), and implant failure.

Dynamic Compression Plating (DCP) and Intramedullary Nailing (IMN) are the two primary surgical methods. DCP allows direct fracture visualization and rigid fixation, often leading to better union rates, particularly in complex fractures. However, it requires extensive soft tissue dissection, increasing the risk of infection and nerve injury. IMN, being minimally invasive, reduces soft tissue damage, supports periosteal blood supply, and enables faster healing. Yet, it is associated with complications like shoulder impingement, rotational instability, and hardware issues.

Studies suggest both methods achieve high union rates, with plating potentially yielding slightly better results in certain scenarios. Functional outcomes vary: IMN may impair shoulder function, while elbow function remains comparable across techniques. The surgical approach should be tailored to individual cases based on fracture pattern, patient condition, and surgeon expertise.

AIMS AND OBJECTIVES

Aim:

To evaluate and compare the Interlocking Nailing and Plating in the management of shaft of Humerus fracture.

Objectives:

1. To evaluate and compare the improvement of the DASH scores between Interlocking Nailing and Plating.
2. To compare the incidence of associated complications between Interlocking Nailing and Plating.

MATERIAL AND METHOD

The present study was conducted in the Department of Orthopaedics at Dr KN Singh Memorial Institute of Medical Sciences And Hospital, Gadia, Barabanki, Uttar Pradesh, India, a tertiary care center with comprehensive orthopedic services. A total of 60 patients with humeral shaft fractures were enrolled and managed either by intramedullary interlocking nailing (IMN) or dynamic compression plating (DCP). The sample size was calculated based on VAS scores from a previous study by Kothari et al., using GPower software, with 30 patients in each group. The study was a prospective clinical comparative analysis conducted over 18 months (October 2023–March 2025). Inclusion criteria included adults aged 18 and above with diaphyseal humeral fractures, while exclusions involved epiphyseal fractures, pathological fractures, and high-grade open injuries. DCP used a 4.5 mm narrow plate with screws, while IMN used cannulated nails ranging from 6.0–8.0 mm. Preoperative stabilization was provided using U-slabs, and surgical fitness was ensured. Postoperative outcomes were assessed using the Visual Analogue Scale (VAS) for pain and the Disabilities of the Arm, Shoulder, and Hand (DASH) score at 4, 12, and 24 weeks. Complications such as infections, nerve injuries, and implant failures were monitored. Ethical clearance was obtained prior to the study. Data were analyzed using SPSS v25.0, applying t-tests, Mann-Whitney U, Chi-square, or Fisher's exact test as appropriate. A p-value <0.05 was considered statistically significant. The study ensured validity through appropriate outcome measures and reliability via standardized methods, consistent follow-up, and proper calibration of assessment

tools. All data were documented in a structured case report form, with confidentiality and ethical standards maintained throughout the study duration.

RESULTS

Table 1: Sex Wise Distribution of Cases

Sex	Nailing Count (%)	Plating Count (%)	Total Count
Male	25 (41.7%)	18 (30.0%)	42 (70.0%)
Female	5 (8.3%)	12 (20.0%)	18 (30.0%)
Total	30 (50.0%)	30 (50.0%)	60 (100%)

Out of the total study participants, 42 (70%) were male, with 25 (41.7%) undergoing nailing and 18 (30%) undergoing plating. In contrast, 18 (30%) were female, with 5 (8.3%) undergoing nailing and 12 (20%) undergoing plating. The total number of cases in the study was 60, with an equal distribution of nailing (30) and plating (30) procedures.

Table 2: Age Wise Distribution of Cases

Age Group	Nailing Count (%)	Plating Count (%)	Total Count (%)
21–40	15 (25.0%)	13 (21.7%)	28 (46.7%)
41–60	12 (20.0%)	12 (20.0%)	24 (40.0%)
61–80	3 (5.0%)	5 (8.3%)	8 (13.3%)
Total	30 (50.0%)	30 (50.0%)	60 (100%)

Out of the total study participants, 28 cases (46.67%) belonged to the 21-40 years age group, with 15 cases (25%) undergoing nailing and 13 cases (21.67%) undergoing plating. In the 41-60 years age group, there were 24 cases (40%), with an equal distribution of 12 cases (20%) in both nailing and plating groups. The 61-80 years age group comprised 8 cases (13.33%), with 3 cases (5.0%) treated with nailing and 5 cases (8.33%) treated with plating.

Table 3: DASH Score Improvement

Variable	Interlocking Nailing (n=30)	Plating (n=30)	p-value
Mean DASH Score at 24 weeks	15.2 ± 4.7	12.9 ± 3.9	0.045

Out of the total study participants, the mean DASH score at 24 weeks was 15.2 ± 4.7 in the Interlocking Nailing group (n=30) and 12.9 ± 3.9 in the Plating group (n=30), with a statistically significant p-value of 0.045.

Table 4: Complications

Complication	Interlocking Nailing (n=30)	Plating (n=30)	p-value
Superficial Infection	2	3	0.65
Deep Infection	1	1	0.99
Implant Failure	1	2	0.52
Non-Union	1	1	0.99

Superficial infection was observed in 2 cases in the interlocking nailing group and 3 cases in the plating group, with a p-value of 0.65. Deep infection occurred in 1 case in each group (p=0.99). Implant failure was noted in 1 case in the interlocking nailing group and 2 cases in the plating group (p=0.52). Non-union was reported in 1 case in both groups (p=0.99).

Table 5: Shoulder Stiffness

Variable	Interlocking Nailing (n=30)	Plating (n=30)	p-value
Shoulder Stiffness Incidence	6 (20.0%)	2 (6.7%)	0.042

Shoulder stiffness incidence was observed in 6 (20.0%) cases in the interlocking nailing group, whereas it was noted in 2 (6.7%) cases in the plating group. The p-value for this comparison was 0.042, showing a statistically significant higher risk of shoulder stiffness with nailing.

DISCUSSION

The present study aimed to evaluate and compare Interlocking Nailing (ILN) and Plating (DCP) in the management of humeral shaft fractures with special emphasis on functional outcome using DASH scores and the incidence of complications. A total of 60 patients were equally divided into ILN and DCP groups, and multiple variables were assessed.

Our results showed a significantly better DASH score at 24 weeks in the plating group (12.9 ± 3.9) compared to the nailing group (15.2 ± 4.7), with a p-value of 0.045. This finding aligns with the study by Philip and Paul (2017), who reported superior clinical union rates and a higher percentage of excellent and good outcomes in the plating group. Similarly, Rathod et al. (2017) emphasized that DCP yielded better functional outcomes compared to ILN, especially in diaphyseal fractures, which supports the present study's outcome on functional scores.

Regarding complications, both groups showed comparable rates of superficial and deep infections, implant failure, and non-union. However, shoulder stiffness was significantly more frequent in the ILN group (20%) compared to the plating group (6.7%), with a p-value of 0.042. This observation concurs with findings by Thakor et al. (2021), who reported decreased shoulder range of motion in patients undergoing intramedullary nailing, potentially due to proximal nail entry and impingement.

The present study also found comparable complication rates between both groups, consistent with Saini et al. (2022), who concluded that both ILN and DCP offer favorable outcomes with minimal complications when applied appropriately. However, Ram Mohan et al. (2021) observed that ILN is more suitable for transverse fractures, while plating is preferred for comminuted fractures or those with associated neurovascular injury, highlighting the importance of individualized treatment planning.

CONCLUSION

In this study of 60 patients with humeral shaft fractures, the majority were males (70%), and most cases occurred in the 21–40 age group. Both interlocking nailing and plating were equally used. Functional outcomes assessed by DASH scores at 24 weeks showed significantly better results in the plating group (12.9 ± 3.9) compared to the nailing group (15.2 ± 4.7), with a p-value of 0.045. Complications such as infection, implant failure, and non-union were similar in both groups. However, shoulder stiffness was significantly higher in the nailing group (20%) than in the plating group (6.7%), indicating a functional disadvantage of nailing.

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