

ORIGINAL ARTICLE

Comparison of Outcomes of Nailing Versus Plating in Humeral Diaphyseal Fractures in Adults

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ABSTRACT

Background: Humeral shaft fracture accounts for approximately 3% of all the types of fractures and is the most common type of fracture occurring in adults. A surgical intervention for a humeral shaft fracture is controversial whether as to intervene or not but for other types of fractures like multiple fractures, severely displaced fractures, a comminuted fracture and fractures where there is vascular and nerve injury surgical intervention is definitely required.

Aim: Outcomes of comparison between I/M interlocking nail and plating in fractures of humerus shaft in adult patients.

Methodology: A randomized clinical trial was conducted at the Department of Orthopedic Surgery, Sh. Zayed Hospital, Lahore over a period of six months. 190 patients (divided in two equal groups by lottery method) were included. Informed consent was taken. Demographics like age, gender, duration of fracture were obtained. In group A patients underwent surgery by using IMN fixation. In group B, patients underwent surgery by using plate. Patients were followed-up in OPD of 10 days. Then patients were followed-up further in OPD for 24 weeks. If union achieved in 24 weeks, then success was labeled.

Results: Total of 190 patients, mean age was calculated as 39.57±8.09 years in group A and 40.01±8.79 years in group B. There were 62(32.6%) males whereas 48(25.3%) were females in group A and that 63(33.2%) were male whereas 32(16.8%) were females in group B. Frequency of success was 94(49.5%) in group A and 92(49.4%), in group B. Frequency of infection was 1(0.5%) in group A and 2(1.1%) in group B

Conclusion: It is concluded that there was no significant difference in both groups. Intramedullary nail and plate provides good outcome with no complications in the treatment of humerus shaft fractures.

Keywords: Humerus shaft Fracture, Intramedullary nail, Plate.

INTRODUCTION

The most commonly occurring fractures worldwide are those of humerus shaft fractures and accounts for about 1-3% of all the fractures¹⁻³ and out of these almost 90% are closed fractures while the rest 10% are open type fractures. The incidence of humerus shaft fractures happening annually is about 11.5 per 1000,000 people⁴ and the rate of incidence of these fractures occurring gender wise is greater in males than in females. Road traffic accidents are the most common cause of these type of fracture with right side of humerus being fractured more often.^{5,6} Direct injury and fall on outstretched hand and elbow accounts as the main cause of these fractures.⁷

Treatment techniques are likewise progressing for these fractures in both operative and non-operative techniques, at first these fractures are managed with the assistance of hanging casts, polyslings, U casts and shoulder spica did improve the outcome but those treatments had an unfavorable financial impact on the patient in the long run.⁸ Regarding operative treatment, open reduction and internal fixation with plates and screws continues to be the main type of treatment for diaphyseal humerus fractures. Direct fracture visualization is enhanced by Osteosynthesis of plates which also allows anatomical reduction and rigid fracture fixation. And this in turn, as reported has a high rate of achievement of union and functional outcome.⁵ The technique of intramedullary nailing is free from the above related issues and is biomechanically more grounded (a heap sharing device). Intramedullary procedure has no periosteal stripping with rotational and torsional strength, there is minimal surgical intervention, biological fixation, and mobilization occurs early with preservation of fracture hematoma.⁷

Theoretically intramedullary nailing might be a better option for humeral shaft fractures as compared to plating, given the vital attainment of intramedullary fixation of the femur and tibial fractures.⁹ The types of Intra-medullary nails can be either flexible or rigid locking nails used for humeral shaft fractures. These nails can be inserted antegrade through the proximal humerus or retrograde through the distal humerus.

An early mobilization and rotationally stable fixation can become possible with usage of locking nailing. Some of the known complications that arise from antegrade nailing are iatrogenic neurovascular injury during distal locking, shoulder pain due to violation of rotator cuff, non-union due to distraction at fracture site owing to incarceration of mismatched nail in distal fragment.¹⁰ The preferred method by surgeons these days for humeral shaft fractures is internal plating and nailing, reason being rising number of complications with previous method in earlier times where these type of fracture was treated conservatively with method of hanging casts and functional bracing and resulted in mal-union., non-union and primary radial nerve injuries.⁹ Reports regarding fractures of shaft of humerus from comparative studies of plate versus intramedullary nailing have contradictory conclusions.^{5,6,11} One of the trials reported that the successful achievement was 85% in the plating group and 70% in the IMN group and ($p>0.05$), whilst on the other hand infection was 5% in the group where only plating was done and 0% in the group where only nailing was carried out ($p>0.05$).¹² Other trial where the above methods were used found that successful achievement was 92% in the plating group and 92% in the intramedullary interlocking nailing group ($p>0.05$), and infection was found to be 12% in group where plating was done and 4% in nail group ($p<0.05$).¹³

Comparison of intramedullary interlocking nailing with plating in fractures of humeral shaft was the rationale of this study and to compare its outcome. The study was carried out to establish a principal method of practice for the treatment of humeral shaft fractures with the availability of resources in local population considering there are no local reliable studies on the subject.

MATERIALS AND METHODS

A randomized controlled trial was conducted over a period of six months at Department of Orthopedic Surgery, Shaikh Zayed Hospital, Lahore. A total of 190 patients were included in the study. Non-probability, consecutive sampling technique was used to divide the patients in two groups. Patients with age between 20-60 years with AO type (12A1, 12A2, 12A3, 12B1, 12B2 and 12B3) were included in the surgery. Old fractures (>3 weeks), fractures associated neurovascular injury or patients with pre-existing condition like rheumatoid arthritis were excluded from the study.

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Approval for institutional ethical committee was sought beforehand. All the patients were admitted via Emergency and Out-patient Department. Data was acquired for demographics like gender, age, duration of fracture, lateral side, AO type of fracture. Patients were split in groups of two A and B, whereas group A patients had surgery by method of intramedullary interlocking nail fixation whilst group B, patients had surgery by the plating method. General anesthesia was used for surgery in both the groups of patients'. Upon completion of surgery patients were transferred to surgical wards and then discharged in stable condition. Patients were followed-up in OPD of 10 days. After 10 days stitches were removed and wound was evaluated. If there was presence of redness, tenderness, pain at wounds it and pus present at wound site, then infection was labeled. Patients were take care of according to the standard guidelines. For further 24 weeks patients were being followed up in OPD for radiological examination of fracture site obtaining AP and lateral view for assessment of union. If union achieved in 24 weeks, then success was labeled.

All the data was entered and analyzed with SPSS version 22. The quantitative variables like the duration of the fracture and age were expressed using mean and standard deviation while qualitative variables like mode of injury, type of fracture, side of injury, gender, success and infection were expressed using frequency and percentage. Chi-square test was used to compare the success and infection in both groups. P value ≤ 0.05 was considered statistically significant. Data was stratified for age, gender, BMI, duration of fracture, mode of injury and type of fracture and side of injury. Post-stratification, Chi-square test was used to compare the success and infection in both groups for each. P value ≤ 0.05 was considered statistically significant.

RESULTS

Total of 190 (95 in each group) patients fulfilling inclusion and exclusion criteria were selected for comparison of the functional outcome between IMN and plate in the fracture of shaft to humerus in adults. Age distribution of the patients was done, it showed that out of 190 patients, 62(32.6%) were in age group of 20-40 years and 33(17.4%) were in age group of 41-60 years in group A and 25.3% (n=48) were in age group of 20-40 years and 47(24.7%) were in age group of 41-60 years in group B. mean age was calculated as 39.57 \pm 8.09 years in group A and 40.01 \pm 8.79 years group B. Gender distribution of the patients was done, it showed that 62(32.6%) were male whereas 33(17.4%) were females in group A and that 63(33.2%) were male whereas 32(16.8%) were females in group B. The fracture pattern was classified in accordance with AO classification system.

Table 1: Classification of fracture pattern

	Group		Total
	Group A	Group B	
Count	1	2	3
12A1			
% of Total	0.5%	1.1%	1.6%
Count	41	42	83
12A2			
% of Total	21.6%	22.1%	43.7%
Count	4	2	6
12A3			
% of Total	2.1%	1.1%	3.2%
AO type of fracture			
Count	46	47	93
12B1			
% of Total	24.2%	24.7%	48.9%
Count	1	1	2
12B2			
% of Total	0.5%	0.5%	1.1%
Count	2	1	3
12B3			
% of Total	1.1%	0.5%	1.6%
Count	95	95	190
% of Total	50.0%	50.0%	100.0%

Frequency of success was 94(49.5%) in group A and 92(49.4%), in group B. Frequency of infection was 1(0.5%) in group A and 2(1.1%) in group B.

Table 2: Distribution of outcomes

Outcomes	Groups		Total
	Group A	Group B	
Success rate	49.5%	48.4%	97.9%
Infection rate	0.5%	1.1%	1.6%

DISCUSSION

The occurrence of humeral shaft fractures in a population over period of time is 13 per 100,000 per year and represents 3% of all managed fractures. As with the rise in aging population the incidence of these fractures has been increasing. There is a bimodal distribution in occurrence of these type of injuries where it has been affecting both the young and the old population. The above type of fractures has a different etiology in the young and the old. Fragility type fractures common in the elderly (>65 years old), while high energy trauma in the younger patients (<30 years old).

The two most common procedures for humeral shaft fractures are intramedullary nailing and plating² and the application of the above procedure lies with the surgeon to decide as there is no one standard guideline for indication to carry out the about operative method universally.⁴ The perservance of fracture hematoma and periosteal blood supply is said to be the main cause in minimizing healing related problems using IM nailing method but on the other hand there is a risk of shoulder stiffness and pain, possibility of impingement of hardware and risk of further comminution of fracture during reaming or nail insertion. Contrary to IM, with plating method there is direct visualization which provides accuracy of fracture reduction, but this for this method an extensive dissection is a requirement which may pose a risk of iatrogenic radial nerve injury.³

There is a disagreement from several biomechanical considerations with the use of nail in the humerus. Rotational and torsional forces are the major contributors of stress in humerus while in femur and tibia which are the weight bearing bones, the mechanical stresses are found to be bending stress. In transverse or oblique fracture the above stresses and forces are thought to be more relevant. The susceptibility of radial nerve to injury is increased with reaming of humeral fractures because with reaming there is a great chance of separating butterfly fragments or segmentation which in turn affects radial nerve.¹⁴

An observation by Chapman et al. showed good rate of union when he compared antegrade IM nailing with plate fixation methods. There was a high association between increased shoulder impingement and nailing and it was concluded the out of the two modalities plate fixation was safer.¹⁵

The inflatable intramedullary nails seems to be safe, effective and applicable according to Ozan et al for humeral AO/OTA type. Amidsaft fractures. A meta-analysis was performed by Heinemann et al in 2010, where they did not find any noteworthy statistical difference between implants and in the rate of total complications, nerve-palsy non-union, infections or the need for reoperation.¹⁶

For patients with humeral shaft fractures surgical treatment is usually indicated there is a neurovascular injury, open fractures, or where there is an associated elbow and forearm fractures, and polytrauma. Currently on the surgical protocol of humeral shaft fracture there is no clear agreement and guidance. The main surgical methods with its advantages and disadvantages include ORIF, IMN fixation, and MIPO. Many comparative studies and some meta-analysis fractures of humeral shaft treatment with plate and IMN has been done in recent years. A retrospective study was done by Davies et al where it was suggested that humeral MIPO results in remarkably lower pooled major complication rate than that of IMN.¹⁶

CONCLUSION

In current study, we concluded that, there was no significant difference in intramedullary nailing and plating in providing good outcome with no complications in the treatment of humerus shaft fractures.

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