



A COMPARATIVE STUDY OF INTRA MEDULLARY NAIL AND OPEN REDUCTION WITH PLATE FIXATION OF FRACTURES OF BOTH BONES OF FOREARM

Orthopedics

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ABSTRACT

Fracture of upper limbs are one of the most common fractures encountered in day to day orthopaedic practice. Full functional recovery of the fractures should be the main aim of the fracture treatment. Both bone forearm fractures has undergone evolution in management from the simplest conservative measures to the most advanced operative procedures. Improved understanding of fracture pattern physiology of fracture healing and implant metallurgy has added better result. This study has been carried out to compare the functional outcomes of Intra Medullary Nail and Open Reduction with Plate Fixation of Fractures of Both Bones of Forearm. 33 patients were included from tertiary hospitals of a metropolitan city in Maharashtra. Most common age group affected was 21-30 years, right side was involved in 51.5% patients. RTA was most common mode of injury in 60.6% patients, P-value at 6 weeks, 12 weeks, and 6 month for pronation was 0.004, 0.007 and 0.008 respectively and that of supination was 0.013, 0.034 and 0.01. So, Significant difference between mean supination-pronation with respect to group nailing and plating. So for treatment of both bone forearm fracture as far as functional outcome is concerned, patient with close both bone forearm fracture intra medullary nailing is the better treatment option.

KEYWORDS

Both bone forearm fractures, Intra Medullary Nail, Open Reduction with Plate Fixation, Functional outcome of forearm fractures.

Introduction:

Human lives are demanding faster locomotion day by day. One of the hazards of this attempt at quick locomotion is the fractures that occur in limbs. The main aim of fracture treatment today is full recovery of injured limbs and avoidance of 'Fracture Disease'. In day-to-day orthopaedic practice, fracture of forearm bones is one of the commonest injuries.¹ The human forearm is adapted more for mobility than stability. The human forearm serves an important role in upper extremity function, facilitating placement of hand in space thus helping to provide the upper extremity with its unique mobility.²

Forearm bones fractures are relatively common injuries, accounting for 41.1% of the fracture in paediatric population. As the bone remodelling potential in children is high, most forearm fractures can be successfully treated with immobilisation by plaster casting following close reduction.³⁻⁵

Mal-union and non-union occur more frequently because of difficulty in reducing and maintaining the reduction of two parallel bones in presence of pronating supinating muscle having the power to angulate and rotate. The biceps and supinator muscles exert rotational forces in proximal third of radius. In the mid and distal third pronator teres and pronator quadratus come into play.^{6,7}

Modalities of treatment are:

1. Conservative treatment.
2. Open reduction and internal fixation by plates.
3. Close/open reduction and internal fixation by intra medullary nail.
4. External fixation with fixator.

Treatment of broken bones follows one basic rule; the broken pieces must be put back into position and prevented from moving out of place until they are healed. Because radius and ulna rely on each other for support, it is important that they are properly stabilised.

Open reduction and internal fixation with plates and screws is most common type of surgical repair of both bones forearm fractures. During this type of procedure, the bone fragments are first repositioned

(reduced) into their normal alignment. They are held together with screws and metal plates attached to outer surface of the bone. Advantage of this technique is that it provides rotational stability and shorter period of immobilization.

Another method of fixation with intra medullary nails. During this procedure, a specially designed metal rod is inserted through the marrow space in the centre of the bone. The advantage of this surgery is that it has a better cosmetic outcome, shorter operative time and easier hardware removal while disadvantage is that there is little rotational stability.

This study has been carried out to compare the functional outcome of patients treated with intra medullary nail and open reduction with plate fixation.

MATERIALS AND METHODS

Study: Comparative clinical study of patients who undergone fixation of both bone forearm fractures.

Study site: Jehangir and other tertiary care hospitals in Pune.

Study population: Patients treated in various tertiary care hospitals in Pune.

Study Design: Comparative Study

Sample size:

By considering the prevalence of the both bones forearm fracture at our tertiary care centre from previous data is 2%.

We have calculated the sample size by using following formula

$$N = 4 \times P \times Q / L^2$$

N = Sample size

P = prevalence of disease (%) = 2%

Q = 100 - P = 98%

L = experimental error (5%)

$$N = 4 \times 2 \times 98 / (5)^2 = 31.96 \approx 32$$

Over The Duration Of Study Period We Have Studied 33 Cases.

Duration of Study: Duration of Study 1st July 2014 to 31st December

2015.

Follow up time: at interval of 6 weeks, 12 weeks, and 6 months.

Ethical Approval: was obtained from the hospitals ethics committee & all patients were included only after signing written informed consent.

All patients were evaluated at the time of admission with special attention to neurovascular injury and compartment syndrome. All fractures classified according to AO classification. Patients' age, sex, mode of injury, side, AO classification of fracture were noted.

X- Ray with AP view and lateral view, were done to assess the type of fracture, displacement, and plan of treatment. All the patients were applied above elbow plaster slab of plaster of Paris, arm sling pouch was given and upper limb was kept elevated using pillow cover and IV stand. Patients were explained to keep moving their fingers.

Functional outcomes according to Price et al scoring system.⁸

Perfect: no complaints/pain with strenuous physical activity and/or loss of <10 degree forearm rotation.

Good: mild complaints/pain with strenuous physical activity and/or loss of 11-30 degree forearm rotation.

Fair: mild subjective complaints/pain during daily activities and/or loss of 31-90 degree forearm rotation.

Poor: all other results

OBSERVATIONS AND RESULTS:

A total 33 both bone forearm fractures were studied. We have done follow up at interval of 6 weeks, 12 weeks, and 6 months. No any patient lost the follow up before 6 months.

- Most common age group affected was 21-30 years (36.36%).
- Mean age of the patients were 27.15 years in which mean age of nailing group was 21.66 years and that of plating group was 33.73 years.
- Right side most common involved in 51.5% patients and left side in 48.5% patients.
- RTA was most common mode of injury in 60.6% patients followed by history of fall in rest of patients.
- 18 patients underwent for internal fixation with intramedullary nail and 15 patients underwent open reduction internal fixation with plate.

Table 1: Distribution of cases according to AO classification (fracture type).

In our study out of 33 patients 18 patients (54.54%) had type A3 fracture, 8 patients (24.24%) had type B3 fracture, 2 patients (6.06%) had type C1 fracture, 2 patients (6.06%) had type C2 fracture, and 3 patients (9.09%) had type C3 fracture.

Fracture type	Group		Total	p-value
	Nailing	Plating		
A3	13	5	18	0.081
B3	3	5	8	
C1	1	1	2	
C2	1	1	2	
C3	0	3	3	
Total	18	15	33	

Conclusion: By using Fisher's exact test p-value > 0.05 therefore there is no significant association between fracture types with group nailing and Plating.

Table 2: Total hospital stay (THS) wise distribution of cases in study group.

Group	Number of patients	THS		p-value
		Mean	SD	
Nailing	18	2.56	0.78	< 0.001
Plating	15	4.07	1.10	

Conclusion: By using 2 independent sample t-test p-value < 0.05 therefore there is significant difference between mean THS with respect to group Nailing and group Plating.

Table 3: Distribution of cases according to pronation (functional criteria) across all follows up in study group of nailing and plating.

Pronation	Nailing (n=18)		Plating (n=15)		p-value
	Mean	SD	Mean	SD	
6 weeks	40.28	5.28	32.67	7.76	0.004*
12 weeks	58.06	5.72	47.33	12.66	0.007*
6 month	71.11	5.02	60.00	13.50	0.008*

*Significant

Conclusion: By using 2 independent sample t-test p-value < 0.05 therefore there is significant difference between mean pronation (degrees) with respect to group Nailing and group Plating.

Line diagram showing Distribution of cases according to pronation (functional criteria) across all follows up in study group of nailing and plating.

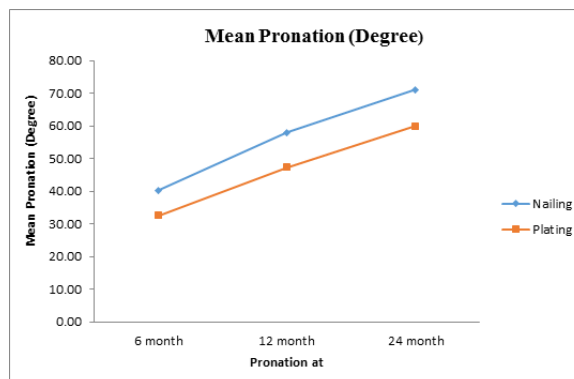


Fig.1 Distribution of cases according to pronation

Table 4: Distribution of cases according to supination (functional criteria) across all follows up in study group of nailing and plating.

Supination	Nailing (n=18)		Plating (n=15)		p-value
	Mean	SD	Mean	SD	
6 weeks	43.89	9.16	34.67	10.60	0.013
12 weeks	61.94	4.25	54.00	12.71	0.034
6 month	75.83	4.93	65.67	12.94	0.01

*Significant

Conclusion: By using 2 independent sample t-test p-value < 0.05 therefore there is significant difference between mean supination (degrees) with respect to group nailing and group plating.

Table 5: Distribution of cases according to functional outcome based on price at el. Criteria in study group of nailing and plating.

Outcome	Group		Total	p-value
	Nailing	Plating		
Fair	0	3	3	0.014
Good	3	6	9	
Perfect	15	6	21	
Total	18	15	33	

Conclusion: By using Chi-square test p-value < 0.05 therefore there is significant association between outcome with group Nailing and Plating.

Table 6: Distribution of cases according to complication in group nailing and plating.

Complication	Group		Total	p-value
	Nailing	Plating		
Present	1	4	5	0.152
Absent	17	11	28	
Total	18	15	33	

Conclusion: By using Fisher's exact test p-value > 0.05 therefore there is no significant association between occurrences of complication with treatment group nailing and group plating.

CONCLUSION

The human forearm serves an important role in upper extremity function, facilitating placement of the hand in space thus helping to provide the upper extremity with its unique mobility. Stable internal fixation with anatomical alignment is the key for successful functional outcome of both bones forearm fracture.

Functional outcome is better in case of intra medullary nailing group because less soft tissue dissection, no periosteum stripping, minimal compromise to bone vascularity and low incidence of infection.

Most of the patients found adolescent to middle age group with male predominance, indicates frequency of fracture particularly more in adolescent to middle age male.

Complications like infection, loss of range of motion, non-union, scarring are more in case of plating.

Hence, we concluded that treatment of both bone forearm fracture as far as functional outcome is concerned, patient with close both bone forearm fracture intra medullary nailing is the preferred treatment option.

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