

A Hospital Based Cross Sectional on Management and Outcome of Fractures of Both Bones of the Forearm by Intra Medullary Nailing

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Abstract

Background: The upper-extremity injury and fracture is commonly seen in orthopaedic practice which accounted for around 8–15% of all the skeletal injuries. The management of the injury by Micronail, one of the modified intramedullary devices allows facilitating the sub-chondral bone in the form of fixed-angle along with development of stability by combined fixation as well as only minimal soft tissue dissection. This study was taken up to assess the clinical outcomes in patients of fracture forearm and treated by flexible intramedullary nailing.

Methods: It is a hospital based prospective interventional study done on 30 patients admitted to Khaja Bandanawaz Teaching and General Hospital attached to Khaja Bandanawaz University, Kalaburagi in the Department of Orthopaedics.

Results: The present study found that 14 (46.7%) of patients had radiological union by 6-8 weeks, none of the patients had 9-11 weeks and 12 weeks of union time. 1(6.7%) of the patients had delayed union and did not show callous upto 12 weeks. When compared with plating group, nailing showed significantly earlier union rates. Average supination range was found to be 81.67±6.17 degrees, pronation of 67 ±5.61 degrees, flexion at wrist was 72.67±3.72 degrees and extension at wrist was found to be 67.67±3.72 degrees. Our study observes that, 12 (86.7 %) didn't have any infection, 2(13.3%) patients had superficial infection and 2(13 %) developed elbow stiffness and none of the patients showed delayed union. The current study shows that mean-time for union was 7.4±2.47 days, 3.8±1.57 days was the mean-time of surgery and 7.4±2.47 weeks was the union time in weeks, whereas 5.20±1.01 was mean hospital stay in days

Conclusion: The intra medullary nailing is less invasive technique allowing the quicker restoration of the function with minimal pain and reduction of complication risks.

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Introduction

The upper-extremity injury and fracture is one of the commonly seen injuries in orthopaedic practice accounting for 8–15% of all the skeletal injuries.[1,2] There are various methods of fractures management in

cases of fracture of forearm involving both the bones. Basically, application of plaster following closed reduction in the management of such fractures stood as the gold standard, although in particular, there

are increased chances of redisplacement.[3,4] Thus, there is an high on fixing most of these fractures. Such fractures may be fixed by extra-medullary devices like plates, but they have various disadvantages such as large incisions, more soft tissue dissection, more chances of infection and a re-surgery of almost similar magnitude for removing an implant. Shoemaker *et al.*, suggested the ideal fixation mode, wherein alignment should be maintained, and must be minimally invasive and having least complications. [5] Now-a-days, it is observed that, the use of intramedullary fixation devices gaining more importance. Meanwhile, there was failure of the past techniques of intramedullary nailing of the distal radius using percutaneous pins (rods) which could not support the subchondral bone, thereby leading to articular collapse. The management of the injury by Micronail, one of the modified intramedullary devices allows facilitating the sub-chondral bone in the form of fixed-angle along with development of stability by combined fixation as well as only minimal soft tissue dissection.[6-8] This study was taken up to assess the clinical outcomes in patients of fracture forearm and treated by flexible intramedullary nailing.

Objectives

1. To evaluate the results of internal fixation of diaphyseal fractures of both bones of forearm treated by closed intramedullary nailing.

Materials and Methods

It is a hospital based prospective interventional study done on 30 patients admitted to Khaja Bandanawaz Teaching and General Hospital attached to Khaja Bandanawaz University, Kalaburagi in the Department of Orthopaedics with fracture both bones of forearm in adults. The study was performed during the period from January 2019 to June 2021 (18months). Totally, 30 cases were considered. An

informed consent was obtained from each patient. Patients above 18 year age of either gender with radiologically diagnosed forearm fractures (Diaphyseal fractures both bone forearm) were included in the study. Whereas, patients with Open fractures, fractures followed by compartment syndrome needing fasciotomy and patients in need of vascular repair were excluded from the study.

Sample Size: It was calculated by considering the union rate as 97.9%, taken from a study done by Khateeb MKN *et al.* [9]. Using Open Epi 2.3.1 software, and power of 80% the sample size was calculated to be 14 and it was rounded off to 15.

The study approval was obtained from the institutional Ethics Committee.

Course in the Hospital: After satisfying the inclusion/ exclusion criteria as per the requirement for the study, careful history was elicited from the patient and/or attendants to understand the mechanism of injury along with severity of trauma. It was followed by clinical evaluation of health status of the patient and assessment of the injury at the site in the form of local examination of injured forearm. Any nerve injury was looked upon and noted. Both views of the radiographs were obtained of radius and ulna. Inclusion of both elbow and wrist joints in each view was ensured. Immobilization of the limb was done by putting above elbow plaster of paris slab with sling. Routine investigations were done, and the patient was taken for surgery. Thus, patients with fracture both bones of the forearm were treated with closed reduction and internal fixation by intramedullary nailing.

Operative Procedure of Intramedullary Nailing

The patient was placed in supination and the forearm was placed on hand table compatible with C arm and tourniquet was not used in the procedure. An appropriate nail based on its required size was selected after measuring the width of the radius bone medullary canal. It was ensured that selected nail should

occupy at least 60% of medullary space. The entry was done by 3.2mm drill bit on distal radius located just medial to lateral tubercle, beneath the extensor pollicis longus tendon nearly about 5mm proximal to the wrist joint. C arm was used to confirm the position following the entry into the medullary canal by a curved awl. The selected titanium elastic nail/square nail was introduced and passed into the radius bone medullary canal and finally pushed to reach the fracture site gently. Reduction of the fracture fragments was done by gentle manipulation and thus rotating the tip gently secures the entry of the nail into the distal fragment.

An inserted nail was ensured continuously for its placement with C arm. It was passed until it reached the neck of the radial bone. Nail was cut after slightly withdrawing it. Cut end of the nail was made to lie flush with the bone by gently hammering it. An appropriate nail was inserted in the ulna by entering through olecranon. Thus reduction of the fracture fragments was done and gently it was manipulated to reach distal fragment. The left over tip of the nail was cut and buried. Suturing of the wounds were done. An above elbow POP slab was put post-operatively. Antibiotics and analgesics were administered until suture removal was done to the patient.

Results

Table 1: Showing distribution of age, gender, side, mode of injury, time of surgery and type of injury

Variables	Frequency (Percentage)
Age	
<30	5(33.3%)
>30	10(66.7%)
Total	15(100%)
Mean \pm SD	39.53 \pm 13.26
Gender	Nailing
Female	7(46.7%)
Male	8(53.3%)
Total	15(100%)
Side of injury	Nailing
Left	8(53.3%)

Suture/staples were removed on 14th post-operative day and check X-ray was obtained in both anteroposterior and lateral views. After 3 weeks in the follow-up, an above slab was changed to below elbow slab. Thus after 6 weeks, there was discontinuation of slab and exercises such as active movements of pronation and supination were started.

Follow-up

All patients were followed up regularly at monthly intervals for the initial 3 months and evaluation was done based on “Anderson *et al*” scoring system.[11] movements at elbow and wrist joints were noted and radiological assessment of the union was done. Union in the site of fracture was noted when there was presence of periosteal callus bridging the fracture site and trabeculation extending across the fracture line.

Statistical Analysis

Data collected was analyzed by using SPSS 22.0 version software. Data was presented in terms of proportions and percentages .For quantitative data analysis tests such as unpaired t-test and ANOVA were applied for statistical significance. If p-value was less than 0.05, it was considered as statistically significant.

Right	7(46.7%)
Total	15(100%)
Mode of Injury	Nailing
Asl	2(13.3%)
Dn	3(20%)
Rta	7(46.7%)
Spr	3(20%)
Total	15(100%)
Time of Surgery in Days	Nailing
1-3	7(46.7%)
4-6	7(46.7%)
7-10	1(6.7%)
Total	15(100%)

In the present study, it was seen that, maximum patients were 30 years and above which was 66.7% and below 30 years were 33.3%. Mean age was 39.53 ± 13.26 years. Male patients were 9 (60%) and female patients were 6 (40%). Patients with left sided fracture were more 8(53.3%). Patients with right sided fracture were 7 (46.7%). It was observed that, RTA is the most common cause of fracture of both bones in forearm in adults which accounts to 7 (46.7%) cases. Fracture due to falls which include domestic nature injury and sports accounts to 5 (23.3%) cases followed by fracture due to direct blow in cases of assault which constitutes 2 (13.3%) cases. There was no significant association noted between the side of injury and the type of injury. Present study observes that, A3 type of fractures were more 10(66.7%), B3 and C3 type fractures were 4(26.7%) and 1(6.7%) respectively. Present study observes that, most patients were operated within 4-6 days 7(46.7%) and 7(46.7%) patients within 1-3 days. In 1(6.6%) case, surgery was taken up in 7-10 days.

Table 2: Showing distribution of subjects according to union time, range of motion, complications, duration of hospital stay and final outcome

Variables		Frequency (Percentage)
Union Time in Weeks		
6-8 Weeks		14(46.7%)
9-11 Weeks		0(0%)
12 Weeks		0(0%)
>12 Weeks		1(6.7%)
Total		15(100%)
Range of Motion (In Degree)		
Rom Supination		81.67 ± 6.17
Rom Pronation		67 ± 5.61
Rom Flexion		72.67 ± 3.72
Rom Extension		67.67 ± 3.72
Complications		
No		12(86.7%)
Yes		2(13.3%)
Yes	1(6.7%)	0(0%)
	1(6.7%)	1(6.7%)
	0(0%)	3(20%)

Total	15(100%)
Recovery Satisfaction	Nailing
Unsatisfactory	1(6.7%)
Poor	0(0%)
Satisfactory	4(26.7%)
Excellent	10(66.7%)
Total	15(100%)

The present study found that 14(46.7%) of patients had radiological union by 6-8 weeks, none of the patients had 9-11 weeks and 12 weeks of union time . 1(6.7%) of the patients had delayed union and did not show callous upto 12 weeks. When compared with the plating group, nailing showed significantly earlier union rates. Average supination range was found to be 81.67 ± 6.17 degrees, pronation of 67 ± 5.61 degrees, flexion at wrist to be 72.67 ± 3.72 degrees and extension at wrist to be 67.67 ± 3.72 degrees. Our Study observes that, 12 (86.7 %) didn't have any infection , 2(13.3%) patients had superficial infection and 2(13 %) developed elbow stiffness and non of the patients showed delayed union.

The average hospital stay was 5.20 ± 1.01 days in patients operated with IM-nailing. In our study, it was observed that, 10(66.7%) of the patients showed excellent recovery, 4(26.7%) showed satisfactory results. None of them showed poor results and 1(6.7%) of them showed unsatisfactory results. The patients showed an appreciable improvement in functional outcome at 6 months follow-up period as evidenced by Anderson *et al* criteria which was found to be statistically significant.

Table 3: Showing mean values of age , time of surgery, union time in weeks and hospital stay

Variables	Plating
Age (Years)	39.53 ± 13.27
Time Of Surgery (Days)	3.8 ± 1.57
Union Time (Weeks)	7.4 ± 2.47
Hospital Stay (Days)	5.20 ± 1.01

Current study shows that, the mean time for union was 7.4 ± 2.47 days. 3.8 ± 1.57 days were mean time of surgery and 7.4 ± 2.47 weeks was union time in weeks. Whereas, 5.20 ± 1.01 days was mean hospital stay

Discussion

In our study, fracture was more common in the third and fourth decade, with average age of 39.53 ± 13.26 years. Our study was comparable to the study made by Frankle Leung and Shew Ping Chow.[12] H. Nevile Burwell and A.D. Charnley in 1964 witnessed 50% of the patients were between second and third decade and an average age was found to be 44.8 years.[13] Our study had a male preponderance of 60% and there were 40% female patients which was

comparable to previous studies. H. Dodge in his study noted that, there were 89% males and 11% females [14]. Michael Chapman noted that, there were 78% males and 22% females [15].

In our study, 46.7% cases had road traffic accidents, 23.3% had fall which was domestic in nature or due to sports and 13.3% suffered direct blow. Our study was comparable to the study done by Grace *et al.*, and Smith. M.W. Chapman reported about

46.7% as incidence of fractures of both bones in the right extremity.[15] We, accounted about, 53.3% incidence of fracture both bones in left extremity. An average time of fracture healing in our study was 6-8 weeks. Chapman study showed 98% cases had a union within a range of 6 to 14 weeks. Wherein, the average union time was 12 weeks.[15] Another study, had an average union time of 10.7 weeks ranging between 5 and 18 weeks.[13] He had a 97.3% union rate. Determination of the range of motion was done and Anderson *et al*, scoring system was used as a measure for the evaluation of the functional outcome.[11] Anderson *et al* reported that, about 54 (50.9%) cases as excellent, 37 (34.9%) satisfactory, 12 (11.3%) unsatisfactory and 2 (2.9%) failure.[11] Chapman *et al* reported 36 (86%) cases as excellent, 3 (7%) satisfactory, 1 (2%) unsatisfactory and 2 (5%) failure.[15] Our study had 66.7% of cases as excellent and 26.7% as satisfactory which was comparable to the previous studies.

In our study, overall, 2(13.3%) patients had superficial infection. 2(13 %) of cases had elbow stiffness. None had delayed union. The superficial infection was managed by usage of appropriate antibiotics after getting culture and sensitivity. One case had elbow stiffness which got recovered considerably by physiotherapy.

Conclusion

Both bones fractures of forearm are associated with high rate of consolidation and satisfactory mobility. Since, we obtain an anatomic reduction of the fracture, as it is most easily achieved by plate fixation. However, nailing is a less invasive technique, which allows restoring function more quickly with less pain and with less risk of complications.

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