J Orthop Spine Trauma. 2025 December; 11(4): 159-62. DOI: 10.18502/jost.v11i4.20286

Research Article

Functional Outcome of Radius Ulna Fracture Treated with Nailing in Adults

Ishani Patel[1], Tarkik K. Amin[1], Ruchit Vyas[1,*], Bruhad Patel[2], Hiten Kayastha[2], Dhaval R. Modi[3]

[1] Associate Professor, Department of Orthopedics, NHL Medical College, Ahmedabad, India
[2] Junior Resident, Department of Orthopedics, NHL Medical College, Ahmedabad, India
[3] Professor, Department of Orthopedics, NHL Medical College, Ahmedabad, India

[*]Corresponding author: Ruchit Vyas; Department of Orthopedics, NHL Medical College, Ahmedabad, India. Tel: +91-9909915924; Email: vyasruchit7@gmail.com

Received: 09 June 2025; **Revised:** 11 August 2025; **Accepted:** 14 September 2025

Abstract

Background: Intramedullary nailing (IMN) of radius and ulna has its own advantages and disadvantages. The chances of infection are significantly decreased, as it is usually a closed procedure and has less periosteal stripping. This study was undertaken to evaluate the results of radius ulna nailing and its radiological and functional outcomes using this method.
Methods: This study of forearm bones fracture treated by IMN was performed on 30 patients prospectively admitted at SVP Hospital Ahmedabad, India, from 2020 to 2022. Clinically, fracture was united when the patient was completely pain free. Patients were followed up at monthly intervals till union and were assessed clinically and radiographically, and details were recorded.
Results: The evaluation of the result was done using Anderson et al. criteria. 28 (93.33%) patients had good to excellent results. Twenty-nine (96.66%) patients had good radiological union. Of these, one patient had union at 22 weeks and one had union at 36 weeks. Twenty-one (70%) patients had union within 4 months.
Conclusion: Use of IMN has resulted in, and continues to result in, predictable and good outcomes. Complication rates are lower compared to plate osteosynthesis, although application of above-elbow (AE) slab is a downside of the procedure. The IMN has a future in repair of forearm fractures considering its low complication rates, low cost, and good results.

Keywords: Intramedullary Nailing; Radius Fractures; Ulna Fractures

Citation: Patel I, Amin TK, Vyas R, Patel B, Kayastha H, Modi DR. **Functional Outcome of Radius Ulna Fracture Treated with Nailing in Adults.** *J Orthop Spine Trauma* 2025; 11(4): 159-62.

Background

Fractures of the forearm bones are relatively common. The forearm allows pronation and supination movements which is important in our daily activities. The treatment of fractures of both bones of the forearm in adults is operative management, and there are various modes of internal fixations available, the choice of which rests with the treating surgeon (1). Conservative management of forearm fractures leads to complications like compartment syndrome, malunion, and bayonet apposition (2).

The treatment of diaphyseal forearm fractures is usually plate osteosynthesis in adults. However, application of a plate can disrupt the periosteal blood supply, increase chances of infection, necessitate skin incisions that may be unsightly, and there is also a risk of refracture if the implant is removed (3). The other modality of the treatment is intramedullary nailing (IMN) which comes with its own sets of advantages and disadvantages. The chances of infection are significantly decreased, as it is usually a closed procedure and has less periosteal stripping. It also has lower refracture rates after implant removal, but it is known to have a higher rate of non-union and malunion.

The use of intramedullary (IM) devices to stabilize the fracture is not new. Ivory pins, Kuntscher (K-nail), Rush nail, and Ender's nail have all been used (4). Nailing of the forearm, beginning with Schöne, predates nailing of the femur and tibia (5). Anatomic problems of the radius, the interdependence of the two bones, and the strong torque loads from pronators and supinators led to its slower technical development.

In general hospitals, open reduction and internal fixation (ORIF) that is done with plating requires occupancy of the bed for a long period and adds unnecessary burden on the hospital and increases the rate of infection; therefore, the ORIF loses its merits as compared to closed IM fixation (1).

However, in IMN, rotational stability is difficult to maintain; thus, we use thicker nails to jam the canal for better rotational and overall stability to tackle the problems of non-union and malunion.

This study aims to evaluate the results of nailing radial and ulnar fractures and its radiological and functional outcomes.

Methods

This study included 30 patients with forearm bone fracture treated by IMN at our institute during the period of 2020-2022. Patients above 18 years old with fractures of the shaft of radius and ulna, isolated fracture of the shaft of radius or ulna, Monteggia and Galeazzi fractures, or open grade 1 and 2 fractures with minimum of 6-month follow-up were included in this study. Patients associated with neurovascular injury, pathological fractures, open grade 3 fractures, and age below 18 years were excluded from this study.

Radiography of one joint proximal and one joint distal, i.e., anteroposterior (AP)/lateral views of wrist and elbow, along with radius ulna was done. Patient was admitted to

the trauma center. Above-elbow (AE) splint was given. The wounds, if any, were washed with betadine and saline under aseptic precautions. Intravenous (IV) antibiotics were given in patients with open wounds.

Surgery was performed under general/regional anesthesia on a standard radiolucent table in supine position. Operative limb was painted and draped as per standard protocol.

For ulna fracture, 1 cm incision was put over the olecranon tip deep down to the bone. The shoulder was abducted and internally rotated and elbow flexed to 90 degrees to facilitate the entry. Entry was made with an all over the olecranon process. The point of insertion for entry was in the center of the olecranon and was made approximately 5 mm from the lateral cortex.

The position of the awl for either the radial or ulnar was checked under the C-arm image intensifier in the AP and lateral views. Once the entry portal was taken, a nail of appropriate size (thickness and length) was loaded over the T-handle and inserted through the entry site. The nail was pushed into the medullary canal of the ulna by hand while the assistant helped in reduction, depending on the type of fracture. The distal end of the nail is usually within 1 cm of the tip of ulna. Proximal end of the nail was buried inside the olecranon to avoid impingement.

For radius fracture, the entry was made either through the radial styloid or Lister's tubercle. If the radius is to be nailed through the Lister's tubercle, a 2 cm incision is made just lateral to Lister's tubercle. The extensor retinaculum was divided to expose and identify the extensor pollicis longus (EPL) tendon which was released from its sheath at the Lister's tubercle. The EPL tendon was retracted radially with the extensor carpi radialis longus (ECRL) and entry was taken with the awl over the Lister's tubercle. The awl was introduced at a point of 5 mm from the distal edge of the radius. The wrist was flexed, and the awl was brought into a more horizontal direction to avoid penetration of the volar cortex. The IM canal was entered obliquely through dorsal margin of the radius. For the entry over styloid, the surgeon must identify the distal edge of the radius.

The awl was first inserted perpendicular to bone, and then gradually, it was aligned such that it was in line with the medullary canal to avoid penetration or perforation of cortex. The wrist may have ulnar-deviation to facilitate this entry. The entry into radius or ulna was confirmed under IITV. A radius nail of appropriate size (thickness and length) was selected and pre-bent to match the radial contour. The radius nail was loaded over the T-handle and pushed gently into the medullary canal. The radial nail was inserted up to the proximal border of the bicipital tuberosity of the radius. The nail was buried flush to the bone distally.

Postoperatively, radiographies were done, and patients were immobilized with an AE slab with elevation and asked to perform active finger movements. Patients were discharged between the 2nd to 4th post-op day. Suture removal was done between 10th-14th. An AE slab was applied for 4 weeks, and then mobilization was started and the slab was removed. Patients were evaluated at monthly intervals till union. Radiographically, fracture was considered to be united when visible bridging callus was seen in at least three out of four cortices in AP and lateral views (Figure 1).

Clinically, fracture was considered to be united when the patient did not have any pain at the fracture site.

Figure 1. A) Preoperative X-ray; B) Immediate post-operative X-ray; C) Three-month follow-up X-ray; (D) Final follow-up X-ray

Patients were followed up at monthly intervals till union and were assessed clinically and radiographically and details were recorded (Figure 2). Functional outcome of patients was evaluated using Anderson et al.'s scoring system (6).

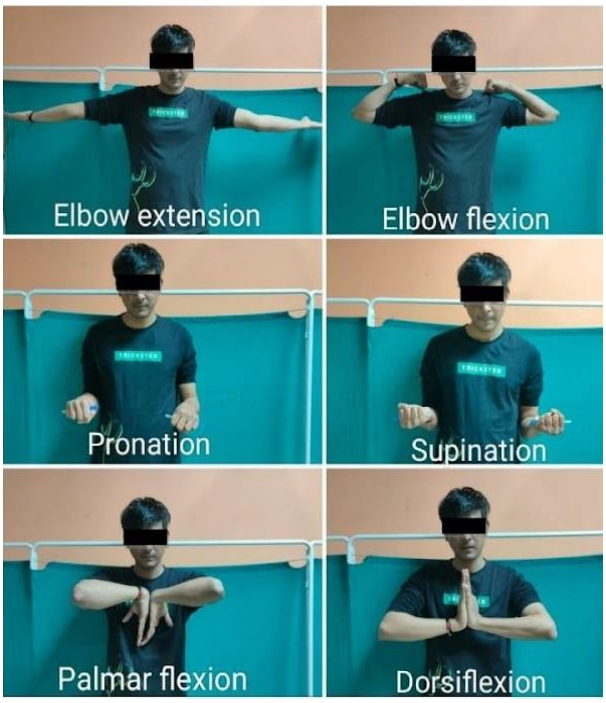

Figure 2. Functional outcome

The ethical committee approval was taken from the institute and informed consent was taken from all the patients.

Results

The age distribution was from 18 to 69 years. In this study, the youngest patient was 18 years old and the eldest was 63 years old. Twenty (66.6%) patients belonged to the age group of 18-39 years. This could be because this is the active age group with more chances of injury.

In our study, 50% of patients sustained injuries due to road traffic accidents (RTAs) and 50% of patients had other modes of injury like assault, fall, and machine injury.

The fractures were documented according to their level; four (13.33%) patients had proximal third fractures, 18 (60%) patients had mid-shaft fractures, and eight (26.66%) had distal third fractures.

In our study, 10 patients (33%) had other associated injuries along with the radius ulna fracture. Amongst them, six had other bone fractures including right index and middle finger proximal phalanx fracture, calcaneus fracture, mid shaft femur fracture, distal femur fracture, proximal tibia-fibula fractures, or mid shaft fibula fracture, three had head injury, and one had abdominal injury. Most of the patients in our study were discharged within two days (70%) of surgery. Delay in discharge was due to associated injuries or medical conditions which required longer hospital stay.

Twenty-nine (96.66%) patients had good radiological union. Of these, one patient had union at 22 weeks and one had union at 36 weeks. Twenty-one (70%) patients had union within four months (Table 1).

Table 1. Radiological union

Variable	Value
Union in weeks	
<12	11 (36.66)
13-16	10 (33.33)
17-20	6 (20.00)
>20	2 (6.66)
Non-union	1 (3.33)

Six patients had terminal restriction of supination and pronation, but this did not affect their day-to-day activity. One patient had early infection before suture removal; the infection was controlled by antibiotics and dressings and recovery was uneventful. Two patients had ulna nail back out but it did not cause much pain on movement. These patients were explained about implant removal, but they were not willing for it. Two patients had nail impingement at the radial entry site leading to restriction of movements at wrist joint. They were explained about the removal of the nail as well. One patient had complex regional pain syndrome which was treated with physiotherapy. One patient had non-union in ulna while radius union was seen at 20 weeks. Patient was explained about operative intervention for ulna, but the patient was not willing for surgery as there was full range of motion (ROM), and as a farmer, he could also lift heavy weights at his farm. The evaluation of the result was done using the criteria of Anderson et al. (6). 28 (93.33%) patients had good to excellent results (Table 2). The patient with nonunion of ulna had poor results according to Anderson et al.'s criteria, but he had good pronation, supination, wrist flexion-extension movements, and he could lift heavy weights.

Table 2. Anderson's criteria for functional outcome (6)

Result	Value	Flexion and extension at wrist	Supination and pronation
Excellent	Present	<10o loss	<25o loss
Good	Present	<20o loss	<50o loss
Fair	Present	<30o loss	>50o loss
Poor	Non-union with or without loss of motion		

Discussion

Non-surgical treatment of fracture of shaft of forearm bones has no or little place due to high rates of nonunion and malunion because of inability to control muscle forces pulling the fracture fragments in different directions, as well as morbidity and joint stiffness due to prolonged immobilization. We have studied 30 cases of forearm bone fractures treated by IMN.

In our study, the majority of our patients were men (60%). The common age group was 18 to 39 in which, there were 66.6% of patients. There was nearly equal incidence of the side (right = 53.33% and left = 46.66%). Smith and Sage studied forearm fracture treated with medullary fixation out of which, 34% were men and 76% were women with mean age of 27 years (7). Talwalkar and Talwalkar studied 270 patients treated with Talwalkar square nail, out of which 76% were men and 24% were women with mean age of 28.5 years (8). In Moerman et al.'s study, 76% were men and 24% were women with mean age of 31.5 years (9).

The commonest mode of injury in most of the studies was RTA. In our study, 50% of patients presented with RTA, 23.33% with fall, 23.33% with assault, and 3.33% with machine injury. In Marek's study, 45.7% of fractures were due to RTA, 37.1% due to fall, 14.1% due to assault, and 2.8% were due to other reasons (10). In Talwalkar and Talwalkar study, 40% were due to RTA, 50% due to fall, 6.6% due to assault, and 3.4% due to other reasons (8). On comparison with other series, the findings are almost similar.

There were 4 (13.33%) cases of open fractures of forearm bones in our study, while rest 26 (86.66%) were closed. In Talwalkar and Talwalkar study, 76.7% were closed fractures and 23.3% were open fractures (8). In Moerman et al.'s study, 84% were closed and 16% were open. Open injury requires proper wound care in the form of debridement and regular dressing with antibiotics coverage to control infection (9). In our study, most (n = 23, 76.66%) of the patients were operated within 24 hours of admission and most (n = 21, 70%) of the patients were discharged within 3 days of surgery. Those who were kept for longer interval had open fractures or had other associated injuries.

The average time to union was 14 weeks in our series which is quite comparable to that with other series as mentioned above. On evaluation of the results using the Anderson et al.'s criteria (6), 28 (93.33%) patients had excellent to good results in our series. One patient had a fair result, but he had no problem with his day-to-day activity. The patient with poor results had ulna nonunion but had no restriction in ROM. It can be inferred that after nailing of forearm bones, most of the patients have a good functional outcome. Restoring the radial bow is essential for reestablishing normal forearm anatomy, as well as for improving forearm rotation and grip strength. In our opinion, the nailing cannot restore normal radial bowing accurately in every patient but, nevertheless, the functional outcome is not significantly compromised.

In our study, 93.33% of patients had good to excellent results which is practically reproduced in all the other series. This goes to show that though anatomical restoration of forearm fractures is not achieved, the functional result is more than satisfactory. IMN as a fixation method of diaphyseal fractures of the forearm has many advantages. It represents a good alternative to internal fixation of fractures using plates and screws. This is due to minimal surgical trauma, scarring, and reduced risk of infection even if an open or limited open reduction is used. Periosteal stripping is avoided, and soft tissue

attachments are maintained, as well as preserving the viability of bone fragments and the fractured bony ends which in turn enhances the fracture healing.

Conclusion

The use of IM nails has resulted in, and continues to result in, predictable and good outcomes. Complication rates are lower compared to plate osteosynthesis, although application of AE slab is a downside of the procedure. The IMN has a future in repair of forearm fractures considering its low complication rates, low cost, and good results.

Conflict of Interest

The authors declare no conflict of interest in this study.

Acknowledgements

The authors thank the patients for their cooperation and permission to publish.

This study received no funding.

References

1. Rao MR, Kader E, Sujith SV, Thomas V. Nail-plate combination in management of fracture both bone forearm. *Orthop Procs*. 2002;84-B(SUPP_III):252-3. doi: 10.1302/0301-620X.84BSUPP_III.0840252e.
2. Rao R. A prospective study of pediatric forearm bone fractures treated with closed intramedullary square nailing. *J Orthop*. 2009;6(1):12.
3. Lee YH, Lee SK, Chung MS, Baek GH, Gong HS, Kim KH. Interlocking contoured intramedullary nail fixation for selected diaphyseal fractures of the forearm in adults. *J Bone Joint Surg Am*. 2008;90(9):1891-8. doi: 10.2106/jbjs.G.01636. [PubMed: 18762649].
4. Barry M, Paterson JM. A flexible intramedullary nails for fractures in children. *J Bone Joint Surg Br*. 2004;86(7):947-53. doi: 10.1302/0301-620x.86b7.15273. [PubMed: 15446515].
5. Street DM. Intramedullary forearm nailing. *Clin Orthop Relat Res*. 1986;34(212):219-30. [PubMed: 3769288].
6. Anderson LD, Sisk D, Tooms RE, Park WI, 3rd. Compression-plate fixation in acute diaphyseal fractures of the radius and ulna. *J Bone Joint Surg Am*. 1975;57(3):287-97. [PubMed: 1091653].
7. Smith H, Sage FP. Medullary Fixation of Forearm Fractures. *J Bone Joint Surg*. 1957;39(1):91-188.
8. Talwalkar AK, Talwalkar CA. Internal fixation of fractures of radius and ulna in adults with Talwalkar intramedullary nails. *Indian J Orthop*. 1967;1(1):26-30.
9. Moerman J, Lenaert A, De Coninck D, Haeck L, Verbeke S, Uyttendaele D, et al. Intramedullary fixation of forearm fractures in adults. *Acta Orthop Belg*. 1996;62(1):34-40. [PubMed: 8669253].
10. Marek FM. Axial fixation of forearm fractures. *J Bone Joint Surg*. 1961;43(8):1099-114.