



## Original Research Article

## Fractures of the radius and ulna in adults: An analysis of factors affecting outcome

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## ABSTRACT

Authors in group collected the data for fracture of the shaft of radius and ulna in 80 adult patients.

**Study Period:** 1<sup>st</sup> October 2014-1<sup>st</sup> October 2017

The aim of the study was to determine relationship of the subjective, objective and radiographic method of treatment. The type of fractures, both open and closed, grade of comminution and other injuries were assessed in patients in term of degree of pain, rotation of forearm and return to the same work following injury and the patients treated with ORIF and plate fixation were having better result in all aspect assessed than closed reduction and plaster cast. Factor most often associated with return to same work after injury are better with ORIF (Open reduction and internal fixation).

Longer time for union and higher rate of infection were the only disadvantages of ORIF over closed reduction, otherwise outcomes were same for both the methods. Presence of other injuries often compromise the end result because of more pain, greater forearm rotation loss and decline in return to same work. The satisfaction and work status in assessment of outcome, concept of functional malunion, interpretation of radiographic finding should help in counselling the patient as to economic and functional impact of these injuries.

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## 1. Introduction

The union with normal anatomical restoration is critical to achieve an optimal outcome for mid shaft fractures of radius and ulna in adults because radius moves around ulna in pronation and supination movements. These objectives are achieved by open reduction and plate fixation. In other studies, the outcome measures other than union have received very little attention and the inclusion of fractures of single bone with fractures of both bones (radius and ulna) cannot be compared with.<sup>1-3</sup> This study was to determine the relationship of outcome to modality of treatment, type of fractures and presence of associated injuries in adults who sustained fractures of the shafts of both radius and ulna. Measures of outcome investigated were patient satisfaction (amount of pain), rotation of forearm, radiographic findings and work status.<sup>4</sup>

## 2. Materials and Methods

## 2.1. Inclusion criteria

1. Mature patients above 18 years of age
2. Fractures of mid-shaft radius and ulna.
3. Patient treated at ACPM medical college and Hospital.
4. Total 80 patients were evaluated by all the authors.

## 2.2. Exclusion criteria

1. Patients under the age of 18 years.
2. Patients with malunion.

Complete information was available for 80 patients who had sustained mid-shaft fractures of radius and ulna. Data collection and radiographic findings were standardized for all 80 patients. All 80 patients were followed at least 24 months from union has occurred. Out of 80 pt, 45 were male and 35 were female. Average age of patients was 29 yrs (ranging from 15 years to 79 y ears). In 43 patients right

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**Table 1:**

Rating	Subjective	Objective	Radiographic
4	No pain	Combined loss of forearm rotation <300	Fracture united .combined malalignment (radius and ulna)<200
3	Mild pain, present with overuse	Combined loss of forearm rotation 31-600	Union, with combined malalignment 21-400
2	Moderate pain present with routine activities	Combined loss of forearm rotation 61-900	Union, with combined malalignment >400
1	Severe pain prevent routine activities	Combined loss of forearm rotation >900	Nonunion,synostosis or osteomyelitis

limb was involved. 30 fractures were open and 50 were closed.

### 2.3. Two methods of treatment were utilized

1. Open reduction with plating (ORIF)
2. Closed reduction with square nailing

The method of treatment was chosen by surgeon and the type of injury. Minimal displacement of closed fractures were the most frequent indication for closed reduction, and marked comminution was the primary reason for treatment with square nails and plaster. All reductions were performed under IVRA with c-arm machine monitoring. The definitive treatment was ORIF in 40 patients, CRIF in 40 patients. The union was defined as presence of bridging callus across the fracture site and nonunion was identified by the absence of callus within twenty-eight weeks following injury. The standards for alignment of radiographs were based on Sage's study, which defined normal as nine degrees of radial and six degrees of dorsal bowing of the radius and zero degrees in both planes for the ulna. The end result ratings were made on a 14 point scale in four

Categories: (a) according the level of pain in the injured limb; (b) by the range of forearm rotation; (c) radiographic criteria of union, synostosis, and malunion; and (d) economic- impact of the injury on the patient's employment status (Table 1).

## 3. Results

### 3.1. Subjective Outcomes

80 percent of patients reported no pain, with no difference between patients with open and those with closed fractures. 82 percent of patients treated with ORIF were pain free at their 24 months, and 62 percent treated with CRIF. Effect observed in group A (ORIF) was 82.8% and effect observed in group B(CRIF) was 66.7%. Out of 80 patients, none of the patient had significant loss of wrist or elbow motion compared to the uninjured side. Average decrease in forearm rotation was 29 degrees with loss of slightly more supination than pronation. No significant difference was present in the loss of forearm rotation between closed and

open fractures.

### 3.2. Radiographic Outcomes

The union occurred in 93 percent of radius fractures and 97 percent of ulna fractures. An average time for union was 17.7 weeks for the radius and 18.3 weeks for ulna. The union was more frequent after closed than after open fractures. Difference was most apparent in radius fractures and opened fracture compared to closed injuries. 11 percent of open fractures developed nonunions, average time for union was 18 percent longer for open than for closed fractures of the radius. 32 percent longer for open fractures of the ulna. Frequency and time for union were unaffected with the method of treatment. After 36 months of treatment the amount of forearm rotation lost was directly proportional to the loss of normal alignment.66 percent of patients had less than twenty degrees of malalignment of the radius and ulna. No difference was present between those patients with open and closed fractures. Modality of treatment, however, had a significant effect on the final radiographic alignment. 81 percent of patients treated with ORIF had less than 20 degrees combined malalignment of the radius and ulna.

### 3.3. Economic outcomes

90 percent of patients with closed fractures and 97 percent of those with open fractures returned to the same work after injury. Difference may be because of the fact that nearly all patients with open fractures were treated by ORIF, while many with closed fractures were treated with CRIF. All patients treated with ORIF returned to the same work following injury more frequently than those treated with CRIF. Presence of other injuries had little effect on the ability of patients to return to the same work following injury. Pain affected the patient's ability to return to the same work following injury. The strongest correlation was with the amount of forearm rotation lost.88 percent of patients who did not return to the same work lost at least sixty one degrees of forearm rotation and only 21 percent of patients who returned to the same work lost this much rotation.

### 3.4. Complications

**Infection:** Infection rate was 9 percent in open fractures and 1.5 percent in closed fractures. Infections were not observed in open fractures treated by immediate ORIF. Infections resolved with surgical debridement and appropriate antibiotic therapy.

**Nerve palsy:** There were Ten palsies recorded prior to treatment. There were no post op palsy.<sup>5,6</sup>

**Synostosis:** No patient had synostosis



Fig. 1: Patient 1



Fig. 2: Patient 2

## 4. Discussion

Present study deals with 80 cases of midshaft radius ulna fractures. Operative methods were compression plating (3.5mm DCP) and intramedullary nailing by square radius ulna nail. Fracture were common in male as well as in females. Right sided forearm is more involved than left. Transverse and oblique fracture were more common than middle third fracture.

In this study, mode of injuries were vehicular accident and fall from height. In this comparative study of fractures of radius ulna by plating versus nailing excellent result in plating were 80.6% as compared to nailing that is 76.2%. In complication superficial infection rate was more common in plating than nailing. None of the patients required implant removal for infection.

There were 5 cases of delayed union plating (2) nailing(3). One each case of nailing and plating has compound fracture has comminution on admission. Delayed union cases were treated with bone grafting and slab, they finally heal by 6-7 months. Thus complication rate was less in plating (13.33%) as compared to nailing which was (26.66%). After success full closed nailing, soft

tissue envelop around the fracture is well preserved with good blood supply to bone ends, because of this biologically fracture healing is rapid in closed nailing.<sup>7</sup> But in open nailing union will be little slow, after plate fixation union will be still more slow due to some soft tissue disturbances. The nail is straight and elastic implant often taking shape of bones, straight nail in the curved canal, but it does not alter bowing of radius<sup>8</sup> and final range of motion. The result was proved at the end of 36 months.

## 5. Conclusion

Out of 80 patients, at the end of 36 months end results following treatments of fractures of the shaft of radius and ulna were good to excellent regardless of the method of treatment, except for longer time to unite and high rate of infection, outcomes of open and closed fractures were also similar. Results with ORIF were better than CRIF, as ORIF minimizes malalignment and resulting loss of forearm rotation.<sup>9</sup> The above two factors were related to ability to return to same work following injury. The interpretation of radiological finding was associated with radiological alignment and functional limitation.

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## 7. Conflict of Interest

None.

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