

**Prospective Hospital Based Study on Functional Evaluation of Surgical Fixation of Distal Radius**Amit Patel<sup>1</sup>, Sadik Shaikh<sup>2</sup><sup>1</sup>Associate Professor, Department of Orthopaedic, Kiran Medical College, Surat<sup>2</sup>Professor, Department of Orthopaedic, Kiran Medical College, Surat

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Conflict of interest: Nil

**Abstract:****Background:** Distal radius fractures are the most recurrent fractures happening in the upper extremity.**Objective:** To assess functional outcome and to assess the effectiveness of surgical fixation in the intra-articular distal end of radius fractures.**Materials and methods:** In this prospective analysis, 40 patients who underwent surgical fixation were included. Following surgery, the patients were checked on at six weeks, three months, six months, and one year. The Gartland and Werley scoring methods were used to evaluate and rate the pain, range of motion, grip strength, and activity. Additionally assessed were radiographic measures.**Results:** forty cases were included and all of them were followed up to one year, most of them were in the age group of 31 to 40 years. Among them 11 were males and 5 were females. Both the dominant side in 31 cases and the non-dominant side in 9 patients were affected. In 31 patients, the mode of injury was a car collision, and in 9 patients, it was a fall. Functional outcome in 10 patients was excellent, 27 patients had good outcome and 3 patients had fair outcome according to Gartland and Werleys scoring system and it was statistical significant ( $p < 0.05$ ).**Conclusion:** Intraarticular distal radius fractures can be successfully treated with surgical fixation for ligamentotaxis.**Keywords:** Closed reduction, distal radius fracture, comminuted fracture, surgical fixator, Gartland and wereley scoring system.

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**Introduction**

The most frequent skeletal injury treated by orthopedic surgeons are distal radius fractures. It exhibits a bimodal age distribution, peaking among young patients who have had high energy trauma and older patients who have suffered low energy falls [1]. Distal radius fractures result in significant annual economic expenditures, which are gradually rising as the population ages [2]. The preferred course of treatment in the past was closed reduction and immobilization in a plaster cast. The integrity of the articular congruence and the kinematics of these articulations, however, can be compromised by fractures that involve the articular surfaces and are relatively unstable. For the wrist joint to function well, the restoration of volar angulation, radial length, and radial inclination is crucial.

Unstable fractures in the distal region of the radius have a predisposition to lose their ability to reduce with non-operative care [3]. Bohler bemoaned the ease with which this type of fracture-dislocation can be reduced in 1929. An unpadded plaster cast, however, is typically unable to keep the fragments

in a good position in the most severe cases. It has been acknowledged that the anatomical repair of the fractured radius frequently has a significant impact on the final functional outcome. Osteoarthritis incidence is reduced and early recovery is facilitated by maintaining articular congruity and stable fixation [4].

Due to its minimally invasive nature and incorporation of ligamentotaxis for reduction, surgical fixation has proven to be effective in treating distal radius intraarticular fractures [5]. We set out to assess the functional success of this strategy to treat distal radius intraarticular fractures in light of minimally invasive surgery.

**Materials and Methods**

Those who had distal radius fractures and visited a Tertiary care hospital between January 2023 and August 2023 were the subjects of a prospective hospital-based clinical study. Ages 18 to 65, no other skeletal injuries, fractures with increased volar/dorsal comminution, >10 degrees angulation

of major fragments, more than 2 mm of articular incongruity, patients whose reduction could not be maintained by closed methods, and open distal radius fractures were the inclusion criteria for patients in this study. Patients with any further concomitant fractures or injuries, distal radius fractures linked to head trauma, patients with co-occurring conditions making surgery impossible, and patients unwilling to participate in the trial were excluded from the study.

**Fracture management:** In the emergency department an initial closed reduction and application of below elbow slab was done for all patients. Radiographs of the forearm with wrist joint in posterior anterior and lateral view were taken.

### Methodology

The patient is in a supine posture with the wounded arm supported by a sidearm board while under general or local anesthesia. While the fracture is being reduced with the wrist in flexion and ulnar deviation, the longitudinal traction is applied with the elbow in 90-degree flexion. Two 3.5-mm pins in the radius near the fracture and two 2.5-mm Schanz pins in the second metacarpal were placed. After achieving a satisfactory closed reduction with an image intensifier, the pins were linked and fastened with solid connecting rod and link joints.

We used a percutaneous K-wire to manipulate the fragments and fix broken radial styloid bones in cases of incomplete reduction (such as step off deformity greater than 2 mm, dorsal tilting, or radial shortening greater than 2 mm) after closed manipulation. All throughout the investigation, a single uniplanar bridging EF system was employed.

The patients were discharged on same day after surgery under proper antibiotic coverage and active finger movements were advised. The patients were recalled to see the reduction in fracture radiologically after 6 weeks. Acceptable criteria for fracture reduction were [5]:

1. Radial inclination of  $>15^\circ$ .
2. Radial shortening of  $<5$  mm compared to the contralateral side.
3. The sagittal tilt between  $15^\circ$  dorsal and  $20^\circ$  volar tilt.
4. Intra-articular step-off of  $<2$  mm.

At six to eight weeks, all surgical fixators were removed, and monitored physical therapy was initiated. Following surgery, all patients were evaluated for pain, grip strength, wrist range of motion (ROM), and activity and scored in accordance with Gartland and Werley at 6 weeks, 3 months, 6 months, and 1 year. [6] The final reduction was examined in the C-arm in anteroposterior and lateral views following the placement of a frame. The pin tract location was dressed with sterile betadine.

### Statistical Analysis

Statistical analysis was performed by using Statistical Package for Social Sciences (SPSS) version 22.0 (SPSS Inc., Chicago, IL, USA). Independent sample t-test was used to compare quantitative between two groups. Fisher's exact test was used to compare number qualitative variables reported between the two groups.  $P < 0.05$  was considered statistically significant.

### Results

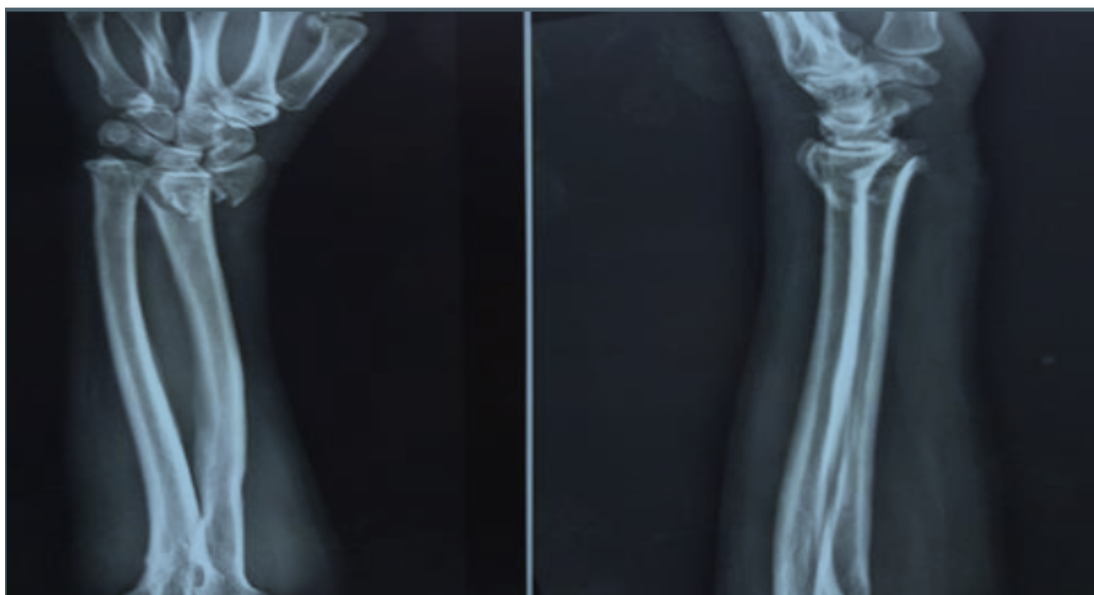


Figure 1: shows pre-operative x-ray of distal radius



**Figure 2: Post Operative X-ray comparison 6 weeks and 6 months**

Figure 2 shows 6 weeks and 6 months post op x-ray comparison the process properly explained in methodology.

**Table 1: Age and Gender wise distribution of study participants**

Age groups	Male	Female	Number (%)
18-20 years	2	0	2 (4)
21-30 years	3	3	6 (12)
31-40 years	11	5	16 (40)
41-50 years	7	3	10 (24)
>50 years	3	3	6 (12)

As per table 1 forty cases were included and all of them were followed up to one year, most of them were in the age group of 31 to 40 years. Among them 11 were males and 5 were females. Both the dominant side in 31 cases and the non-dominant side in 9 patients were affected. In 31 patients, the mode of injury was a car collision, and in 9 patients, it was a fall.

**Table 2: Functional Outcome of patients**

Functional outcome	Number (%)	P- value
Excellent	10 (14)	<b>0.01*</b>
Good	27 (64)	
Fair	3 (6)	
Poor	1 (2)	

As per table 2 Functional outcome in 10 patients was excellent, 27 patients had good outcome and 3 patients had fair outcome according to Gartland and Werleys scoring system and it was statistical significant ( $p < 0.05$ ).

**Discussion**

The most frequent fracture we treat is a distal end radius fracture. The standard of care for nondisplaced, stable fractures with limited radial metaphyseal comminution, little to no height loss, and no significant displacement or angulation continues to be closed reduction and immobilization in a cast. Orthopaedic surgeons have historically found it difficult to treat comminuted intra-articular fractures because it is difficult to reduce the fracture, keep it reduced while the fracture heals, and restore joint function once the fracture has healed. Patient expectations are very high, but due to the seriousness of the injury, soft tissue damage, and periarticular fibrosis

that develop throughout the healing phase, favorable results are not always attainable. A management failure could result in permanent handicap. [6] Axial load transfer from the hand to the distal radius's articular surface was the high energy injury patho mechanism at work. This results in shearing force, which impacts fractures and causes noticeable displacement [7]. According to other studies [8,9], men are 1.7 times more likely than women to sustain such injuries.

Usual indications of Surgical Fixator are [10].

1. Actual or predicted instability in the dorsally displaced extra-articular or minimal articular fracture of the distal radius.
2. Severe articular fractures and open injuries.

In 91% of wrists with any degree of articular step and in all wrists with a step greater than 2 mm, according to Knirk and Jupiter's research, radiographic arthritis developed [11]. A step in the

articular surface up to 2 mm was accepted as a result of their work and that of Melone [12]. Mehta et al.'s [13] arthroscopy aided treatment of intra-articular fractures of the distal radius showed a strong relationship between step size and pain incidence.

In their investigation, patients with no step, 1 mm step, and >1 mm step had pain at rates of 18%, 38%, and 100%, respectively. In our study, we found that intra-articular step of more than 2 mm leads to residual pain and arthritis, and recommend anatomical reduction and acceptance of a step of <2 mm since the size of the step is related to the incidence of pain.

In terms of ulnar variation and volar tilt, Wright et al. and Rizzo et al. observed improved recovery in the open reduction and internal fixation (ORIF) group compared with the EF group [14,15]. The absence of the need for additional implant removal operations is viewed favorably in several poor nations. As a result, healthcare expenses would go down. Since EF removal can be accomplished in an office setting under local anesthetic, it is also able to avoid further difficulties that might result from subsequent surgery (implant removal).

### Conclusion

After a year of follow-up, surgical fixation had a good functional outcome. When performed in accordance with strict surgical guidelines, under aseptic precautions, and with proper fracture reduction with minimal complication rates and good functional outcome based on Gartland and Werley scoring, surgical fixation is an effective method for the management of distal radius fractures. The process is swift, and there is a smaller technical learning curve. With the right medications, complications like pin site infections can be treated.

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