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Original Research Article

A Retrospective Analysis of Outcomes in Patients with Distal Radius Fractures, Including Treatment Methods (E.G., Casting, Surgery), Complications, and Functional Outcomes

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Abstract

Background: Distal radius fractures are one of the most frequently occurring orthopedic injuries across all age groups, and represent a growing problem among elderly individuals, particularly because of osteoporosis and the occurrence of falls. Proper treatment is crucial to ensure a functional wrist and minimize complication rates to provide good clinical and functional recovery.

Methods: This was a retrospective observational study carried out in Orthopaedics Department at Lok Bandhu Raj Narayan Combined Hospital (LBRNCH), Lucknow, and Uttar Pradesh from January 2026 to March 2026. The total of 48 patients with distal radial fractures were included. Hospital records were used to gather data on the patient, fracture characteristics, treatment, complications and follow up. Patients were treated either conservatively with casting/splinting or surgically by Open Reduction and Internal Fixation (ORIF) plating, K-wire fixation or external fixation. The outcomes of clinical and radiologic features were evaluated in a retrospective fashion.

Results: Among 48 patients, 29 (60.4%) were males and 19 (39.6%) were females. The age group 46-60 years had the maximum number of fractures (31.3%). 20 (41.7%) patients had conservative treatment, 16 (33.3%) patients underwent ORIF plating, 8 (16.7%) patients underwent K-wire fixation, and 4 (8.3%) patients underwent external fixation. Complications were realized on 7 (14.6%) patients with stiffness, 6 (12.5%) patients had malunion, 4 (8.3%) had infection, and 3 (6.3%) had hardware complications. Functional outcomes were excellent in 14 (29.2%), good in 18 (37.5%), fair in 10 (20.8%), and poor in 6 (12.5%) patients.

Conclusion: The overall results were favorable for distal radius fracture, and the ORIF plating was more effective for the unstable fracture for functional recovery. Selection of appropriate treatment and rehabilitation at the early stage is still vital in reducing complications and enhancing outcomes.

Keywords: Complications, Distal radius fracture, Functional outcomes, Orthopaedic trauma, Retrospective study, surgical management.

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Introduction

Distal radius fractures are one of the most common orthopedic injuries treated in emergency departments globally. These are fractures of the distal end of the radius (near the wrist joint) and are frequently observed after a fall, sports injury or road traffic accident [1]. There is a bi-modal age distribution both younger people after high-energy trauma and elderly post-menopausal women as a result of osteoporosis and low-energy falls [2]. The most common mechanism is a fall on an outstretched hand, which results in displacement based on the force and the wrist position. The wrist joint is important for the mobility of the upper limb and hand function, which enables a number of activities including grasping, lifting, writing and fine motor tasks [3,4]. The distal radius fracture can be a debilitating injury if not treated properly. Malunion, chronic pain, diminished grip strength, stiffness, deformity, and early onset of osteoarthritis can occur if a fracture does not heal properly [5,6]. These complications have a negative impact on quality of life and can lead to long-term

disability, lower productivity and higher health care expenses [7]. Thus, anatomical reduction and functional recovery are a large treatment goal. Distal radius fracture management is influenced by patient age, fracture pattern, displacement, bone quality and functional demands [8]. Conservative therapy is usually recommended for fractures that have minimal displacement and are stable, such as those treated with closed reduction and plaster casting or splinting [9]. It is a cost-effective technique and it does not involve surgery, but may be associated with secondary displacement or joint stiffness.

Unstable or displaced distal radius fractures are best treated surgically. These include open reduction and internal fixation (using volar locking plates), K-wire fixation and external fixation [10]. While surgery will help correct the alignment and allow for early movement, there is a risk of infection, tendon injury, irritation of the hardware, or neurovascular damage.

There are multiple studies that have examined outcomes of treatment for fractures of the distal radius. Previous literature suggests that conservative management provides satisfactory results in stable extra-articular fractures, especially among elderly patients with low functional demands [11,12]. In unstable or displaced fractures, however, the operative treatment has proven to have better radiological alignment and functional recovery has occurred earlier.

Standardised scoring systems like the Disabilities of the Arm, Shoulder and Hand (DASH) score, Gartland and Werley score, and Modified Mayo Wrist Score are used to assess functional outcomes. These are used to assess pain, range of motion, grip strength and function of daily living.

Though various studies have been conducted internationally, there is still scarce data available on the outcome of the distal radius fracture in North India as a region of tertiary care centers. These differences in patient demographics, mechanism of injury, treatment availability and adherence to follow-up care require institution-specific analysis.

Objective

1. To assess various treatment modalities in distal radius fractures.
2. To evaluate complications of conservative and surgical surgery.
3. To analyze functional outcome after treatment received by patients attending LBRNCH, Lucknow.

Materials and Methods

Study Design: The current study was a retrospective observational study to assess treatment outcomes of distal radius fractures. Medical records of all the patients were reviewed and analyzed with regard to treatment modalities followed, complications encountered and the functional recovery after treatment. This was a retrospective study, so there was no patient intervention or change in treatment protocols during the study period.

Study Setting: This study was carried out in the Department of Orthopaedics, LBRNCH, Lucknow, Uttar Pradesh, India. Tertiary hospital receives a significant number of trauma and orthopaedic cases from the urban population and rural surrounding areas, making it an appropriate hospital to assess the outcomes of fractures. Data retrieval and analysis was performed using medical records kept by the department.

Study Duration: Patient records from January 2026 to March 2026 were included in the study. In this study, data were collected and analyzed in a retrospective way.

Sample Size: A total of 48 patients with distal radius fractures and the inclusion criteria were recruited. Patients were selected based on having complete hospital records and follow-up information.

Inclusion Criteria

- Adults aged 18 years and older who were diagnosed with distal radius fracture from clinical and radiological examinations.
- Patients treated conservatively or surgically at the study hospital.
- Comprehensive medical information, including details of treatment and radiology.
- Patients with well-documented follow-up records adequate to assess clinical and functional outcomes.

Exclusion Criteria

- Inpatients whose medical histories or X-rays are incomplete.
- Cases of pathological fractures caused by malignancy or metabolic bone disorders.
- Multiple associated fracture(s) or systemic injuries that impact outcome for polytrauma patients.
- Patients who were lost to follow-up or lacked sufficient post-treatment documentation.

Data Collection: The data were retrieved from the inpatient records, outpatient records, operation theatre registers, radiology reports and follow-up files of the hospital. Demographic data - age, sex, mode of injury were recorded.

Patient clinical information regarding the side of the fracture, mechanism of injury and type of fracture was recorded if available.

Treatment variables included type of treatment (conservative treatment (closed reduction and casting/splinting) vs. surgical treatment ORIF, k-wire fixation, or external fixation). The recorded complications during follow-up were infection, malunion, delayed union, stiffness, irritation of the hardware, and neurovascular symptoms. Post-treatment progress notes and duration of the follow-up were also analyzed.

Outcome Measures: Both clinical and radiological parameters were used to evaluate treatment outcomes. The pain status was assessed clinically, along with the range of motion of the wrists, grip strength, and the patient's ability to perform their daily activities as recorded at the follow-up visits. Follow-up evaluation of the radiological outcome involved fracture alignment, union evidence and maintenance of reduction on serial X-rays.

Functional outcomes were classified according to documented assessment scores: Modified Mayo Wrist Score or equivalent functional classification within the institutions where available. Results were judged as excellent, good, fair or poor. Any treatment and recovery complications were also documented.

Statistical Analysis: The data collected were analyzed with SPSS software. Analysis was done using descriptive statistics methodology.

Data for the continuous variables were reported as mean ± SD and data for the categorical variables were reported as frequencies and percentages.

Data were tabulated to enable better interpretation of results.

Results

In the present retrospective study, a total of 48 patients were included with the diagnosis of distal radius fracture.

The data was analysed to assess the demographic features, treatment options used, complications faced, and functional outcomes after treatment.

Table 1: Demographic Characteristics of Study Participants

Variable	Category	Frequency (n)	Percentage (%)
Age Group (years)	18–30	10	20.8
	31–45	12	25.0
	46–60	15	31.3
	>60	11	22.9
Gender	Male	29	60.4
	Female	19	39.6

The age distribution of the 48 patients studied showed that fractures of the distal radius were most common in the age group 46–60 years (31.3%) and 31–45 years (25.0%).

The older age group (60 years and above) accounted 22.9% of the patients suggesting more fractures in the elderly population, possibly due to lower bone density and injury with falls.

Male patients were more likely to be affected (60.4%) than females (39.6%) indicating a relatively higher exposure to occupational or outdoor trauma among males.

Table 2: Distribution of Treatment Methods Used

Treatment Method	Frequency (n)	Percentage (%)
Conservative management (Casting/Splinting)	20	41.7
ORIF with plating	16	33.3
K-wire fixation	8	16.7
External fixation	4	8.3

The most common treatment modality was conservative (41.7%) mainly in fractures with stable or minimal displacement.

Overall, (58.3%) of patients underwent surgical treatment. With regard to surgical techniques, ORIF (with plating) was the most frequently used technique (33.3%), which is associated with preference for stable fixation and early mobilization in displaced or unstable fractures. K-wire fixation was the most common method, used in (16.7%) of the cases, external fixation was the least commonly used (8.3%) and was mostly used in complex fracture patterns.

Table 3: Complications Observed Following Treatment

Complication	Frequency (n)	Percentage (%)
No complications	28	58.3
Infection	4	8.3
Malunion	6	12.5
Wrist stiffness	7	14.6
Hardware complications	3	6.3

In the follow-up period, over half of the patients (58.3%) had no documented complications.

The most frequent complication was noted to be wrist stiffness in (14.6%) of patients, especially in those who needed long immobilisation or physiotherapy. The prevalence of malunion was (12.5%) and was most frequently observed in conservatively treated patients with secondary displacement. (8.3%) were infected, primarily the surgically treated patients.

In 6.3% of patients, there were hardware-related issues (such as implant irritation or discomfort).

Table 4: Complications According to Treatment Type

Treatment Type	Number of Cases	Cases with Complications	Percentage with Complications (%)
Conservative management	20	7	35.0
ORIF plating	16	5	31.3
K-wire fixation	8	2	25.0
External fixation	4	2	50.0

The proportion with external fixation had the highest rate of complications (50.0%), possibly because it was used in fragmented and more severe fractures.

The complication rate of the conservative treatment was (35.0%), most often the result of malunion and stiffness. The ORIF plating group had a complication rate of (31.3%), primarily infection and hardware complications.

When the outcomes of different fixation methods were compared, K-wire fixation had relatively lower complication rates (25.0%), suggesting that this fixation method has favorable results in selected cases.

Table 5: Functional Outcomes Following Treatment

Functional Outcome	Frequency (n)	Percentage (%)
Excellent	14	29.2
Good	18	37.5
Fair	10	20.8
Poor	6	12.5

The majority of patients showed satisfactory recovery after treatment in the functional outcome assessment. The majority of patients had a good functional outcome (37.5%), followed by excellent functional outcome (29.2%). In (20.8%) of cases, fair recovery was observed, and in (12.5%) cases poor functional outcome, usually related to complications such as stiffness, malunion, or persistent pain was observed.

Table 6: Functional Outcome According to Treatment Method

Treatment Method	Excellent/Good n (%)	Fair/Poor n (%)
Conservative management	11 (55.0)	9 (45.0)
ORIF plating	13 (81.3)	3 (18.7)
K-wire fixation	6 (75.0)	2 (25.0)
External fixation	2 (50.0)	2 (50.0)

The functional results were best in patients treated by ORIF plating (81.3% excellent or good recovery). In (75.0%) of the cases, a satisfactory outcome was obtained in K-wire fixation.

The conservative group had poorer outcomes of excellent or good (55.0%) which may have been caused by increased stiffness and malunion. The results of the external fixation were comparatively unfavourable, probably due to more severe injury patterns in these patients.

Discussion

The current retrospective study assessed the outcomes, complications, and functional recovery

of 48 patients who were treated for distal radius fractures in the tertiary care center. The most frequent fracture group was the 46-60 years age group, followed by the group of patients aged 31-45 years. This study indicates a progressive increase in fracture rates as a person grows older, which is probably due to a decrease in bone mineral density and to trauma from falls. The gender difference observed in this study is consistent with a higher number of male road traffic accidents, physical activity-related injuries and occupational exposure among men.

In the present study, the most frequently adopted management strategy was conservative with casting or splinting (41.7%). Overall, however, surgery accounted for a greater percentage of patients, which included those with unstable and displaced fractures requiring anatomical reduction and fixation. Among the surgical techniques, ORIF with plating was the most common procedure. The findings are similar to those reported in previous studies [13], which showed a preference for volar locking plate fixation because of greater fracture stability, alignment and early mobilization.

Functional outcome analysis revealed that plating ORIF had the greatest recovery, with most patients achieving either excellent or good outcomes. This discovery corroborates the previous literature that shows improved short-term functional recovery and radiological alignment with plate fixation in unstable distal radius fractures. In selected cases, K-wire fixation also proved to be effective, probably because of its minimally invasive nature and applicability for less complex fracture patterns [14]. Conservative treatment was correlated with a decrease in the proportion of excellent or good recovery. This may be due to prolonged immobilization, secondary displacement and delayed rehabilitation.

Complication analysis showed that the most frequent complication was wrist stiffness, followed by malunion, infection, and hardware-related complications. A stiffness of the wrist may be caused by prolonged casting, inadequate physiotherapy or late mobilization, especially in those treated conservatively [15]. Loss of reduction was observed more frequently in malunion cases in the non-operative group, in keeping with previous work, which suggested that loss of reduction is a contraindication to casting in unstable fractures. The most common complications with infection and hardware were limited to surgically managed patients and were generally low. The highest complication rate was realized with external fixation; this could be because it was used in more severe or fragmented fractures rather than because of the technique of fixation.

Functional recovery was satisfactory with excellent or good outcomes in most. The results point to the need for fracture-specific treatment planning. Stable fractures can be treated conservatively, and displaced or unstable fractures might be treated using surgical stabilization, especially with the use of ORIF plating.

Study Limitations

There are some limitations of the present study. However, being a retrospective study, the researchers had limited control over data completeness and standardization of follow-up. Findings were not generalizable because the sample size was small, and the study was carried out at a single center. Moreover, differences in follow-up periods and functional scores recorded could have affected the results of outcome assessment.

Conclusion

In the current study, the distal radius fracture was found to be more prevalent in middle-aged and older individuals, with males being more affected than females. Conservative treatment was still commonly used, especially for stable fractures, and surgical treatment was preferred to be used for unstable and displaced fractures. When compared to other treatment modalities, ORIF with plating had the greatest functional results, with a higher percentage of excellent and good recovery.

The most frequent complications noted were wrist stiffness and malunion, especially in the conservatively treated patients. The incidence of surgical complications (infection and complications due to hardware) was relatively low. The results indicate that the choice of treatment should be personalized, depending on fracture features, age and functional requirements. Appropriate rehabilitation and follow-up are essential to maximize recovery and reduce complications. These findings support a positive clinical outcome for ORIF plating in specific distal radius fractures.

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