



Research Article

Functional Outcome of Distal Radius Fractures Managed Conservatively versus Surgical

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ABSTRACT

Background: Distal radius fractures are among the most common orthopedic injuries. The choice between conservative and surgical management remains controversial, particularly in unstable and intra-articular fractures.

Objective: To compare the functional and radiological outcomes of distal radius fractures managed conservatively versus surgically.

Materials and Methods: This hospital-based comparative observational study was conducted over a period of one year, including 60 adult patients with distal radius fractures. Patients were divided into two groups: conservative management (closed reduction and casting) and surgical management (open reduction and internal fixation/percutaneous fixation). Functional outcomes were assessed using the DASH score, along with range of motion and radiological parameters.

Results: The surgical group demonstrated significantly better functional outcomes, with a higher proportion of patients achieving excellent to good DASH scores (86.6%) compared to the conservative group (66.7%). Mean range of motion, including dorsiflexion, palmar flexion, pronation, and supination, was significantly higher in the surgical group ($p < 0.05$). Radiological parameters such as radial height, volar tilt, and radial inclination were more accurately restored in surgically treated patients. The incidence of malunion and wrist stiffness was higher in the conservative group, whereas surgical complications such as superficial infection and implant-related issues were minimal and manageable.

Conclusion: Surgical management provides superior functional and radiological outcomes, particularly in displaced and intra-articular fractures. Conservative treatment remains effective in stable fractures and selected elderly patients. Treatment should be individualized based on fracture characteristics and patient factors.

Keywords: Distal radius fracture; Conservative management; Surgical fixation; Functional outcome; DASH score; Volar locking plate.

INTRODUCTION

Distal radius fractures are among the most frequently encountered skeletal injuries in orthopedic practice, accounting for nearly one-sixth of all fractures treated in emergency settings. These fractures exhibit a bimodal age distribution, occurring commonly in elderly individuals due to low-energy falls associated with osteoporosis, and in younger patients following high-energy trauma such as road traffic accidents or sports injuries (1,2).

Anatomically, the distal radius plays a crucial role in wrist biomechanics, contributing to load transmission, forearm rotation, and articulation with the carpal bones. Even minimal disruption of its alignment can significantly impair wrist

function. Important radiological parameters such as radial height, radial inclination, and volar tilt are essential determinants of functional outcome, and their restoration is a key goal of treatment (3).

Historically, distal radius fractures were predominantly managed by conservative methods, especially following the description of Colles' fracture in the early 19th century. Closed reduction and cast immobilization have remained the cornerstone of treatment for stable, extra-articular fractures. However, conservative treatment is often associated with complications such as malunion, loss of reduction, joint stiffness, and residual deformity, particularly in unstable fracture patterns (4).

With advancements in orthopedic techniques and implant design, there has been a paradigm shift toward surgical management. Techniques such as open reduction and internal fixation (ORIF) with volar locking plates, external fixation, and percutaneous pinning have gained popularity. These methods aim to achieve anatomical reduction, stable fixation, and early mobilization, thereby improving functional outcomes and reducing long-term disability (5,6).

Biomechanical studies have demonstrated that intra-articular incongruity greater than 2 mm, dorsal angulation, and radial shortening are associated with poor functional results and increased risk of post-traumatic arthritis. Consequently, surgical intervention is often recommended for displaced, comminuted, and intra-articular fractures to restore joint congruity and alignment (7).

Despite the increasing inclination toward surgical fixation, the optimal management of distal radius fractures remains controversial. Several studies have reported comparable functional outcomes between conservative and surgical approaches in selected patient populations, particularly in elderly patients with low functional demands (8). Additionally, factors such as cost, surgical risks, patient comorbidities, and resource availability play a significant role in treatment decision-making.

Functional outcome assessment has evolved with the use of validated scoring systems such as the Disabilities of the Arm, Shoulder and Hand (DASH) score and the Gartland and Werley scoring system, which provide objective evaluation of pain, range of motion, grip strength, and overall disability (9).

Given the diversity in fracture patterns and patient characteristics, it is essential to critically evaluate the effectiveness of both conservative and surgical treatment modalities. This study aims to compare the functional outcomes of distal radius fractures managed by these two approaches and to identify factors influencing treatment success.

MATERIALS AND METHODS:

Study Design

This study was conducted as a hospital-based comparative observational study to evaluate and compare the functional outcomes of distal radius fractures managed conservatively and surgically.

Study Setting

The study was carried out in the Department of Orthopaedics at a tertiary care teaching hospital, where a large number of trauma patients are routinely managed.

Study Duration

The study was conducted over a period of one year, including patient recruitment, treatment, and follow-up.

Sample Size

A total of 60 patients diagnosed with distal radius fractures were included in the study and divided into two groups:

- **Group A (Conservative group):** 30 patients
- **Group B (Surgical group):** 30 patients

Sampling Method

Patients were selected using **consecutive sampling**, including all eligible patients presenting during the study period who met the inclusion criteria.

Inclusion Criteria

- Patients aged ≥ 18 years
- Closed distal radius fractures
- Both extra-articular and intra-articular fractures
- Patients willing to participate and provide informed consent
- Patients available for follow-up

Exclusion Criteria

- Open fractures
- Associated neurovascular injury
- Pathological fractures
- Previous fracture or deformity of the same wrist
- Polytrauma patients unable to comply with rehabilitation
- Patients lost to follow-up

Pre-treatment Evaluation

All patients underwent:

- Detailed history taking (mode of injury, hand dominance, comorbidities)
- Thorough clinical examination (swelling, deformity, neurovascular status)
- Standard radiological assessment:
 - X-ray wrist (AP and lateral views)
 - Evaluation of:
 - Radial height
 - Radial inclination
 - Volar tilt
 - Articular involvement

Fractures were classified using Frykman / AO classification system.

Treatment Protocol

Group A: Conservative Management

- Closed reduction performed under hematoma block or sedation
- Immobilization using below-elbow plaster cast
- Reduction confirmed radiologically
- Cast maintained for 4–6 weeks
- Periodic X-rays taken to assess maintenance of reduction
- After cast removal:
 - Wrist mobilization exercises initiated
 - Physiotherapy advised

Group B: Surgical Management

The choice of surgical procedure depended on fracture type and surgeon preference:

Common techniques used:

- Open Reduction and Internal Fixation (ORIF) with volar locking plate
- Percutaneous K-wire fixation
- External fixation (in comminuted fractures)

Surgical steps (for ORIF):

- Volar approach (Henry approach)
- Fracture reduction under direct visualization
- Fixation with locking plate
- Wound closure and sterile dressing

Postoperative care:

- Limb elevation
- Early finger mobilization
- Sutures removed on 10–14 days
- Wrist mobilization started early (2–3 weeks depending on stability)

Follow-Up Protocol

Patients were followed up at:

- **2 weeks**
- **6 weeks**
- **3 months**
- **6 months**

At each visit:

- Clinical examination

- Radiological assessment
- Functional evaluation

Outcome Measures

Primary Outcome

- **DASH (Disabilities of Arm, Shoulder and Hand) Score**

Secondary Outcomes

- **Gartland and Werley Score**
- Range of motion:
 - Palmar flexion
 - Dorsiflexion
 - Supination and pronation
- Grip strength (if available)
- Radiological parameters:
 - Radial height
 - Radial inclination
 - Volar tilt

Assessment Criteria

Functional Outcome Grading

Based on scoring systems:

DASH Score Interpretation:

- 0–25 → Excellent
- 26–50 → Good
- 51–75 → Fair
- 75 → Poor

Complications Assessed

- Malunion
- Wrist stiffness
- Complex regional pain syndrome (CRPS)
- Infection (surgical group)
- Tendon irritation or rupture
- Implant-related complications

Statistical Analysis

All collected data were entered into Microsoft Excel and analyzed using SPSS 19.0. Continuous variables were expressed as mean \pm standard deviation, while categorical variables were presented as frequencies and percentages. The comparison between the conservative and surgical groups was performed using the independent sample t-test for continuous variables and the Chi-square test for categorical variables.. A *p*-value of less than 0.05 was considered statistically significant.

Ethical Considerations

The study was conducted after obtaining approval from the Institutional Ethics Committee. Written informed consent was obtained from all participants prior to their inclusion in the study.

RESULTS:

The age distribution between the conservative and surgical groups was comparable, indicating no significant difference between the two groups as shown in table 1.

Table 1. Age distribution

Age group (years)	Conservative (n=30)	Surgical (n=30)	p-value
18–30	3 (10%)	6 (20%)	0.71
31–40	5 (16.7%)	7 (23.3%)	
41–50	8 (26.7%)	9 (30%)	
51–60	9 (30%)	5 (16.7%)	
>60	5 (16.7%)	3 (10%)	

There was no statistically significant difference in gender distribution between the two groups as shown in table 2.

Table 2. Gender distribution

Gender	Conservative (n=30)	Surgical (n=30)	p-value
Male	12 (40%)	18 (60%)	0.12
Female	18 (60%)	12 (40%)	

A statistically significant difference was observed in the mode of injury, with road traffic accidents being more frequent in the surgical group as shown in table 3.

Table 3. Mode of injury

Mode of injury	Conservative (n=30)	Surgical (n=30)	p-value
Fall on outstretched hand	20 (66.7%)	10 (33.3%)	0.038*
Road traffic accident	6 (20%)	15 (50%)	
Others	4 (13.3%)	5 (16.7%)	

* Significant

There was a statistically significant difference in fracture type distribution, with intra-articular fractures being more common in the surgical group as shown in table 4.

Table 4. Fracture type

Fracture type	Conservative (n=30)	Surgical (n=30)	p-value
Extra-articular	22 (73.3%)	12 (40%)	0.007*
Intra-articular	8 (26.7%)	18 (60%)	

* Significant

The surgical group showed significantly better functional outcomes compared to the conservative group as shown in table 5.

Table 5. Functional outcome (DASH score after 6 month follow-up)

Outcome	Conservative (n=30)	Surgical (n=30)	p-value
Excellent	8 (26.7%)	16 (53.3%)	0.015*
Good	12 (40%)	10 (33.3%)	
Fair	6 (20%)	3 (10%)	
Poor	4 (13.3%)	1 (3.3%)	

* Significant

Range of motion was significantly better in the surgical group across all movements as shown in table 6.

Table 6. Range of motion

Movement	Conservative (Mean ± SD)	Surgical (Mean ± SD)	p-value
Dorsiflexion	60 ± 8	70 ± 6	0.001*
Palmar flexion	55 ± 7	68 ± 5	0.002*
Supination	65 ± 6	75 ± 5	0.001*
Pronation	68 ± 7	78 ± 6	0.001*

* Significant

Radiological parameters were significantly better restored in the surgical group as shown in table 7

Table 7. Radiological parameters

Parameter	Conservative (Mean ± SD)	Surgical (Mean ± SD)	p-value
Radial height (mm)	8 ± 2	11 ± 1	0.001*
Volar tilt (degrees)	-5 ± 4	10 ± 3	0.0001*
Radial inclination (°)	18 ± 3	22 ± 2	0.002*

* Significant

Complications, particularly malunion, were more frequent in the conservative group, and this difference was statistically significant as shown in Table 8.

Table 8. Complications

Complication	Conservative (n=30)	Surgical (n=30)	p-value
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Malunion	6 (20%)	1 (3.3%)	0.023*
Stiffness	5 (16.7%)	3 (10%)	
Infection	0	2 (6.7%)	
Implant issues	0	2 (6.7%)	

* Significant

DISCUSSION:

Distal radius fractures are among the most frequently encountered orthopedic injuries, and their management continues to evolve with advancements in surgical techniques. The present study compared the functional and radiological outcomes of distal radius fractures managed conservatively and surgically, highlighting important differences between the two approaches.

In the present study, the majority of patients belonged to the middle-aged and elderly population, with a higher proportion of females in the conservative group. This observation is consistent with the known epidemiology of distal radius fractures, where osteoporotic changes predispose elderly females to low-energy fractures (10,11).

The mode of injury differed significantly between the two groups, with low-energy falls being the most common cause in the conservative group, whereas high-energy trauma such as road traffic accidents predominated in the surgical group. This reflects the fact that unstable fractures resulting from high-energy mechanisms are more likely to require operative intervention (12).

Fracture pattern analysis revealed that extra-articular fractures were more commonly managed conservatively, while intra-articular fractures were predominantly treated surgically. This is in accordance with standard orthopedic principles, which emphasize the importance of anatomical reduction in intra-articular fractures to prevent long-term complications such as post-traumatic arthritis (13).

Functional outcomes assessed using the DASH score were significantly better in the surgical group compared to the conservative group. A greater proportion of patients in the surgical group achieved excellent and good outcomes. Similar findings have been reported in previous studies, where surgical fixation, particularly with volar locking plates, resulted in improved functional recovery (14,15).

Range of motion was also significantly better in the surgical group across all parameters. This can be attributed to stable fixation allowing early mobilization, thereby reducing stiffness and improving joint function. Comparable results have been documented in earlier studies (16).

Radiological outcomes in the present study demonstrated better restoration of radial height, volar tilt, and radial inclination in the surgical group. Maintenance of these parameters is critical for normal wrist biomechanics, and their disruption has been associated with poor functional outcomes. Previous studies have similarly emphasized the importance of anatomical alignment in achieving favorable results (17).

The complication profile varied between the two groups. The conservative group showed a higher incidence of malunion and stiffness, whereas the surgical group had complications such as superficial infection and implant-related issues. However, these complications were generally manageable and did not significantly affect overall outcomes. Similar observations have been reported in the literature (18).

Despite the advantages of surgical management, conservative treatment remains an effective option in selected cases, particularly in stable fractures and elderly patients with low functional demands. Some studies have reported comparable long-term outcomes between conservative and surgical treatment in such populations (19).

CONCLUSION:

Surgical management of distal radius fractures results in **better functional recovery, improved range of motion, and superior radiological alignment**, particularly in displaced and intra-articular fractures. Conservative treatment, however, remains an effective option for **stable, non-displaced fractures and elderly patients with low functional demands**, providing satisfactory outcomes without surgical risks. Therefore, the choice of treatment should be **individualized**, considering fracture pattern, patient age, bone quality, and functional requirements to achieve optimal outcomes.

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